DAMOS
DISPOSAL AREA MONITORING SYSTEM

Summary of Program Results
1981-1984

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Sections II and III

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II. New London Disposal Area

III. Rhode Island

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II. NEW LONDON DISPOSAL AREA

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II. NEW LONDON DISPOSAL AREA

1.0 INTRODUCTION

The New London Disposal Site is located two miles south of the mouth of the Thames River (Fig. II-1-1). During 1977-1979, more than 1.6 million cubic yards of dredged material from the Thames River were deposited at this site; the bulk of which was dumped from September 1977 to May 1978. A further 3.6 million cubic yards of dredged materials were placed at this site from March 1979 to November 1981. Figure II-1-2 summarizes disposal activities at the site since the start of 1979. As can be seen, approximately 400,000 cubic yards of materials were dumped during the period from 29 May 1979 to 27 December 1980. This disposal operation overlapped another major disposal activity at New London Disposal Site which was initiated on 12 December 1979 and temporarily halted on 10 January 1980 after approximately 2 million cubic yards of material were deposited. The project was resumed on 10 October 1980 and terminated on 15 January 1981 when an additional 900,000 cubic yards of material were deposited at the site. The remaining 400,000 cubic yards were contributed by miscellaneous small dredging projects from adjacent areas of New London Harbor.

From 1981 to the present, several surveys of the New London site have been conducted to document the disposal operations and any change due to natural processes. Methods utilized during these surveys include precision bathymetry, sediment grab sampling, and REMOTS image analysis.

2.0 RESULTS

2.1 Bathymetry

Precision bathymetric surveys were conducted at the New London Disposal Area using the SAIC Navigation and Data Acquisition System interfaced to a Del Norte Trisponder positioning unit and an Edo Western 24 kHz fathometer.

In January 1982, a survey grid consisting of 37 east-west oriented lanes, 2100 meters long and spaced 50 meters apart was established (Fig. II-2-1). Figure II-2-2 presents the contour chart of the area. A dredged material mound resulting from disposal prior to 1979 is clearly evident in the northern quadrant rising to within 13 meters of the surface. The large broad mound covering the west center of the survey was the result of disposal during the 1977-79 operation, which has been somewhat altered during subsequent operations. Three small contiguous mounds in the east-center of the survey resulted from operations between 1980 and 1982.

In August 1982, the same survey grid was repeated and revealed the same topographic features (Fig. II-2-3). Following

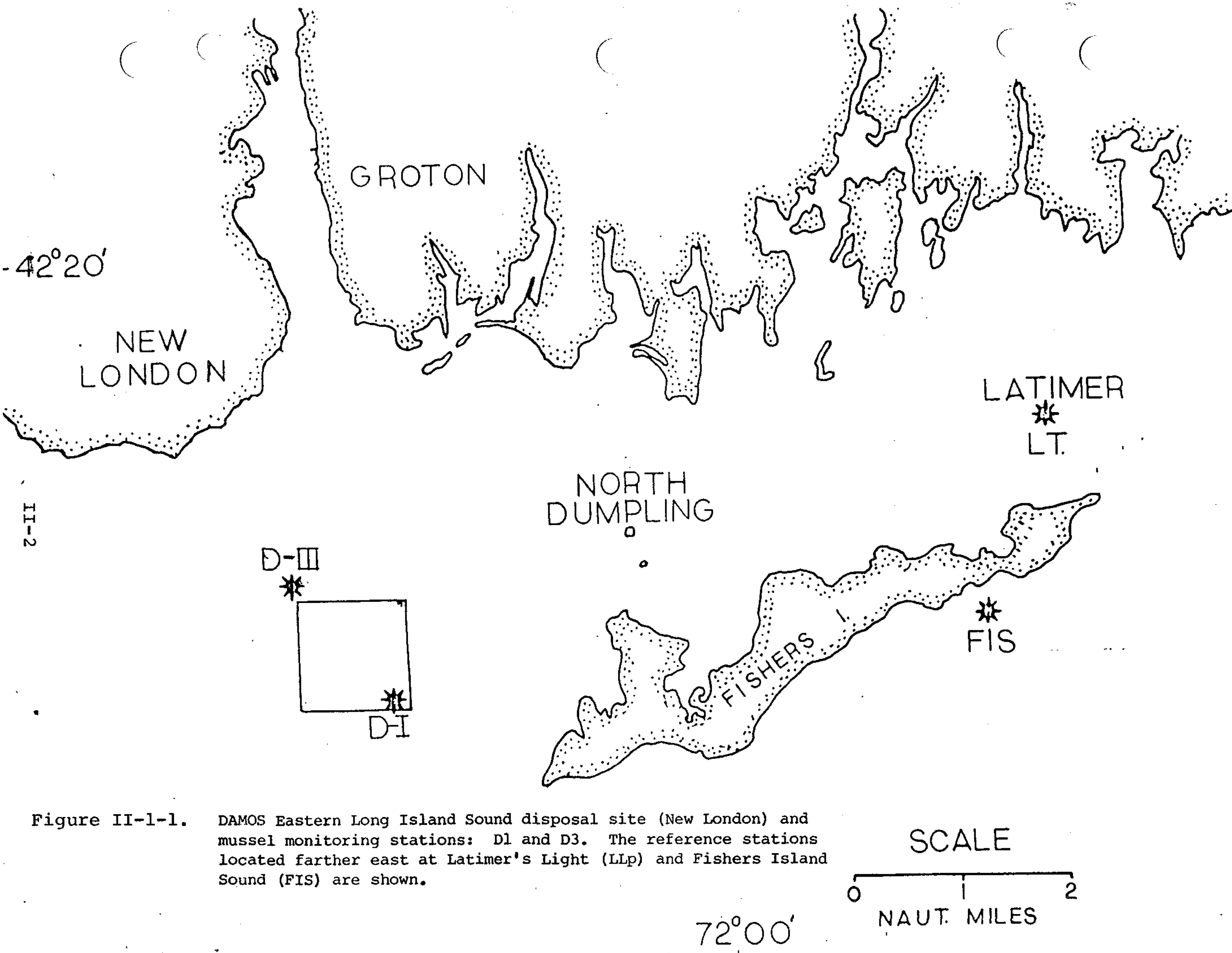


Figure II-1-1. DAMOS Eastern Long Island Sound disposal site (New London) and mussel monitoring stations: D1 and D3. The reference stations located farther east at Latimer's Light (LLp) and Fishers Island Sound (FIS) are shown.

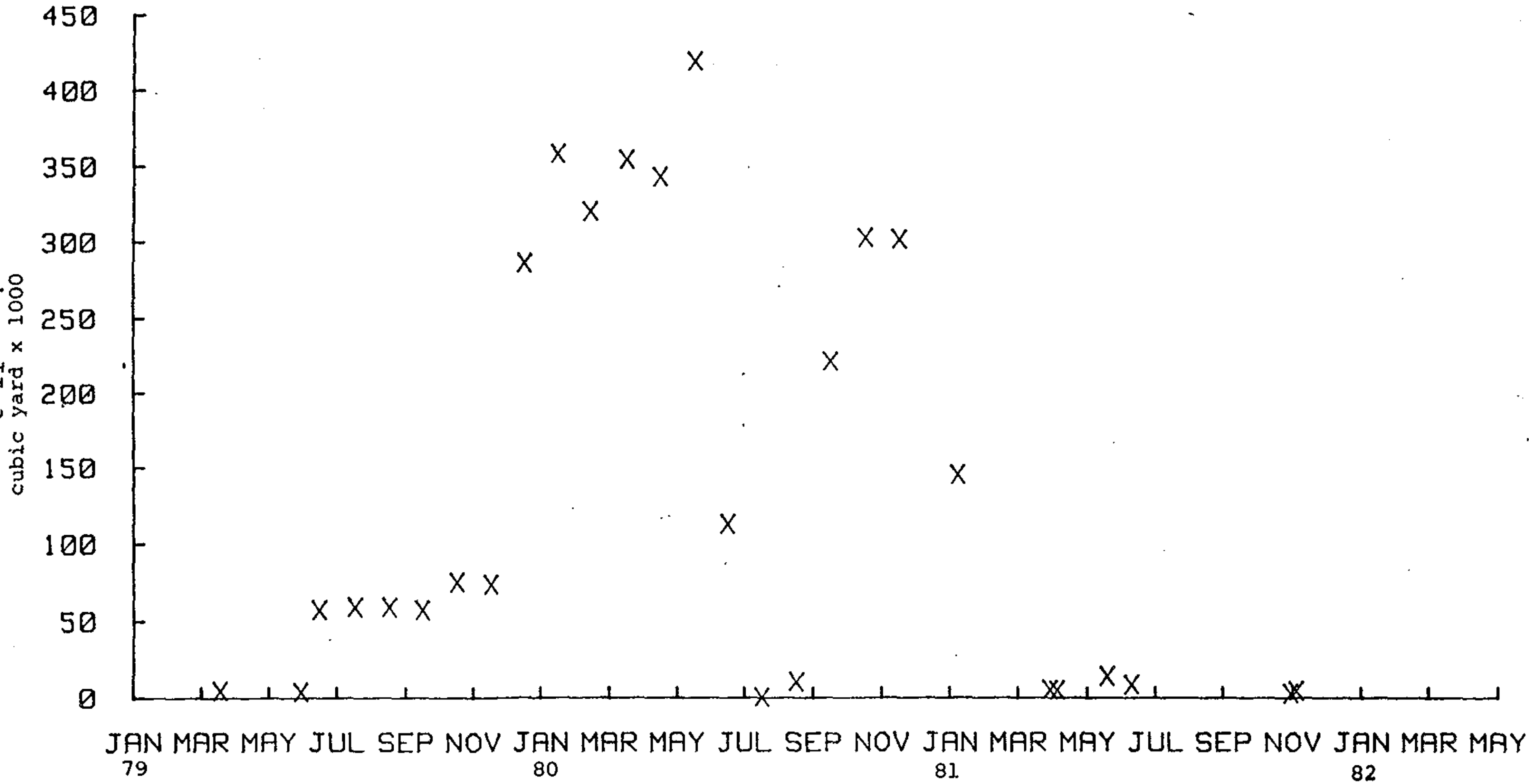


Figure II-1-2. Temporal variations of dredge materials (volumes) deposited at the Eastern Long Island Sound Disposal Site from January 1979 to November 1981.

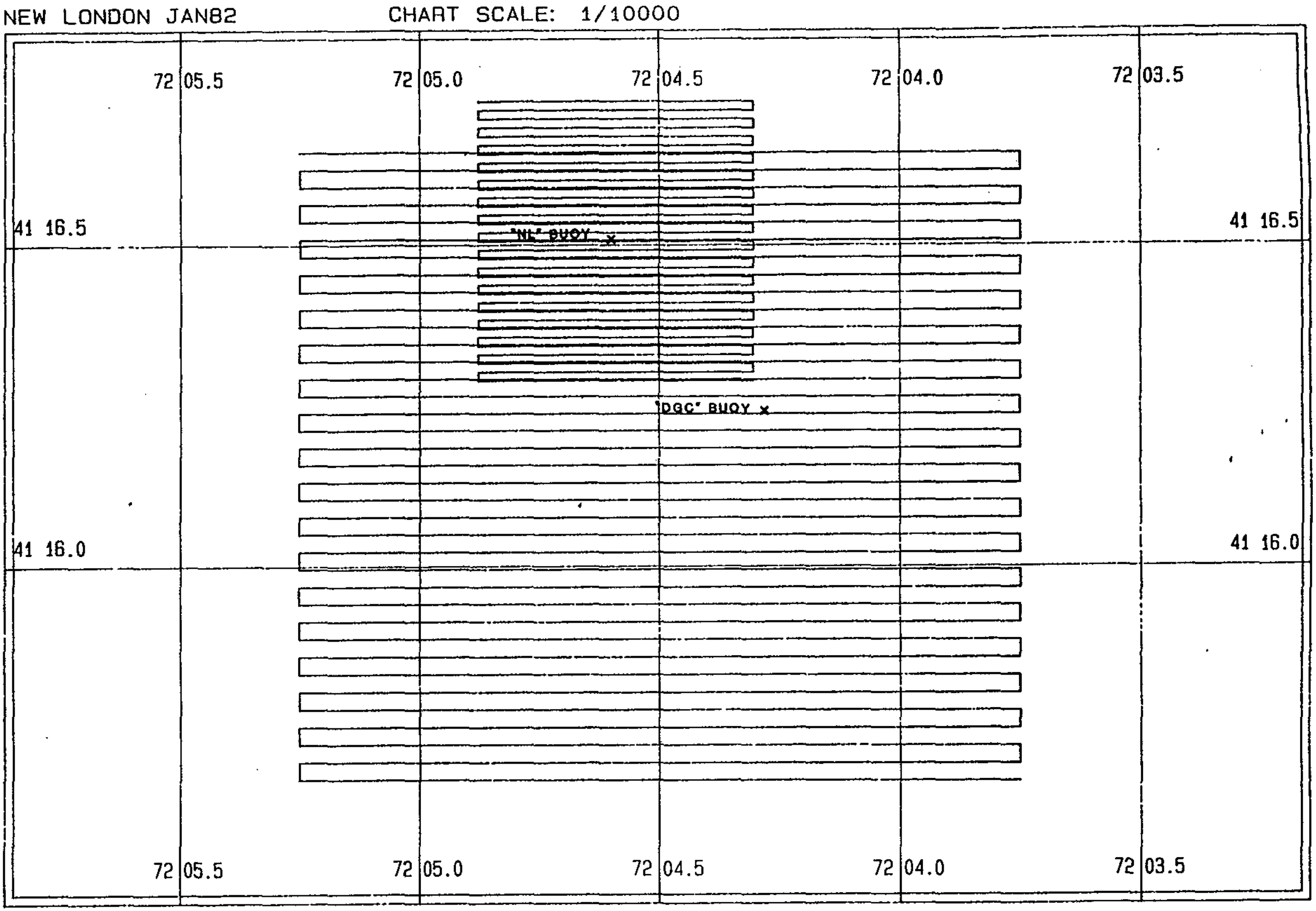


Figure II-2-1. The New London Disposal Area.

NEW LONDON

JANUARY 1982

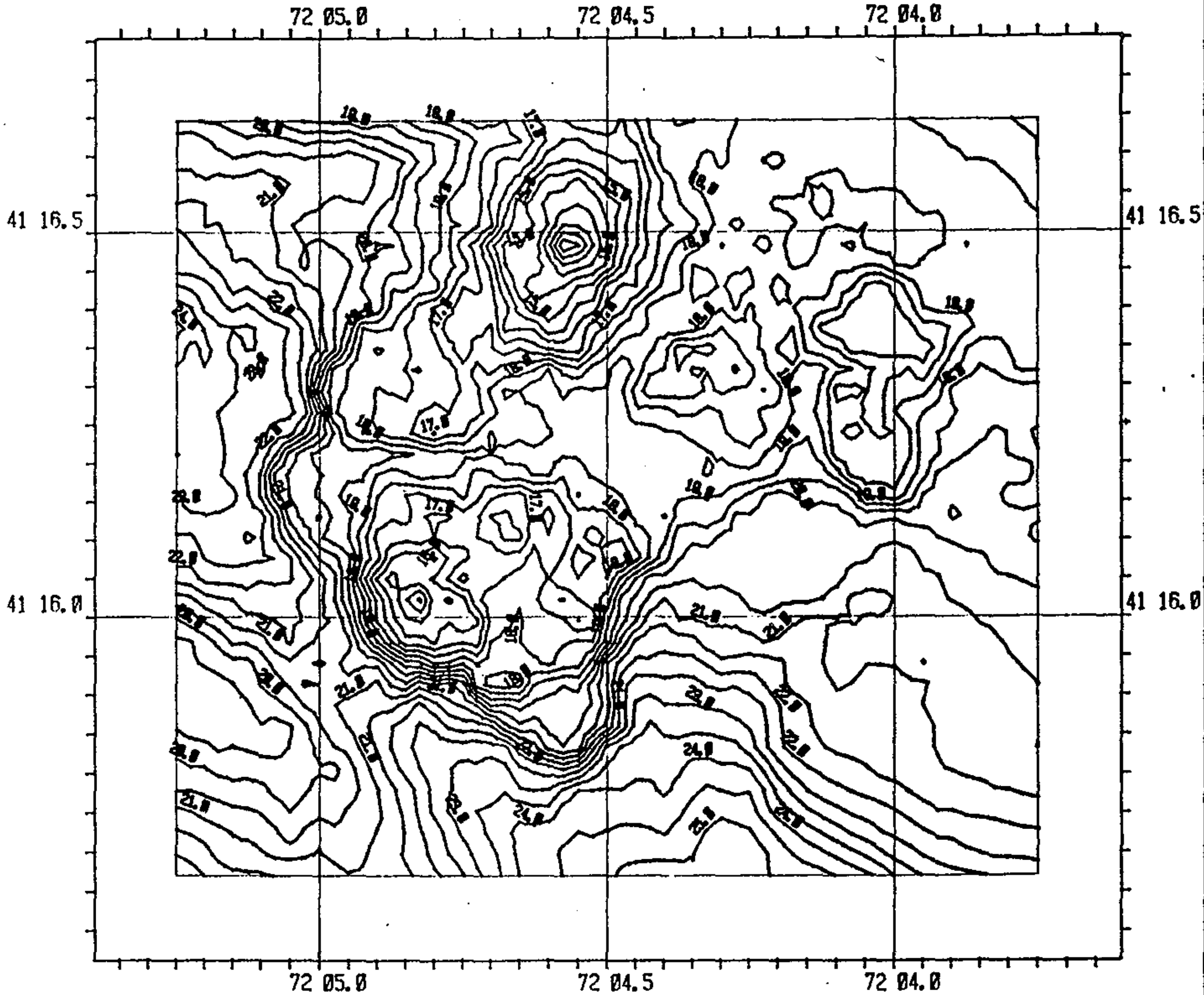
INTERVAL: .5

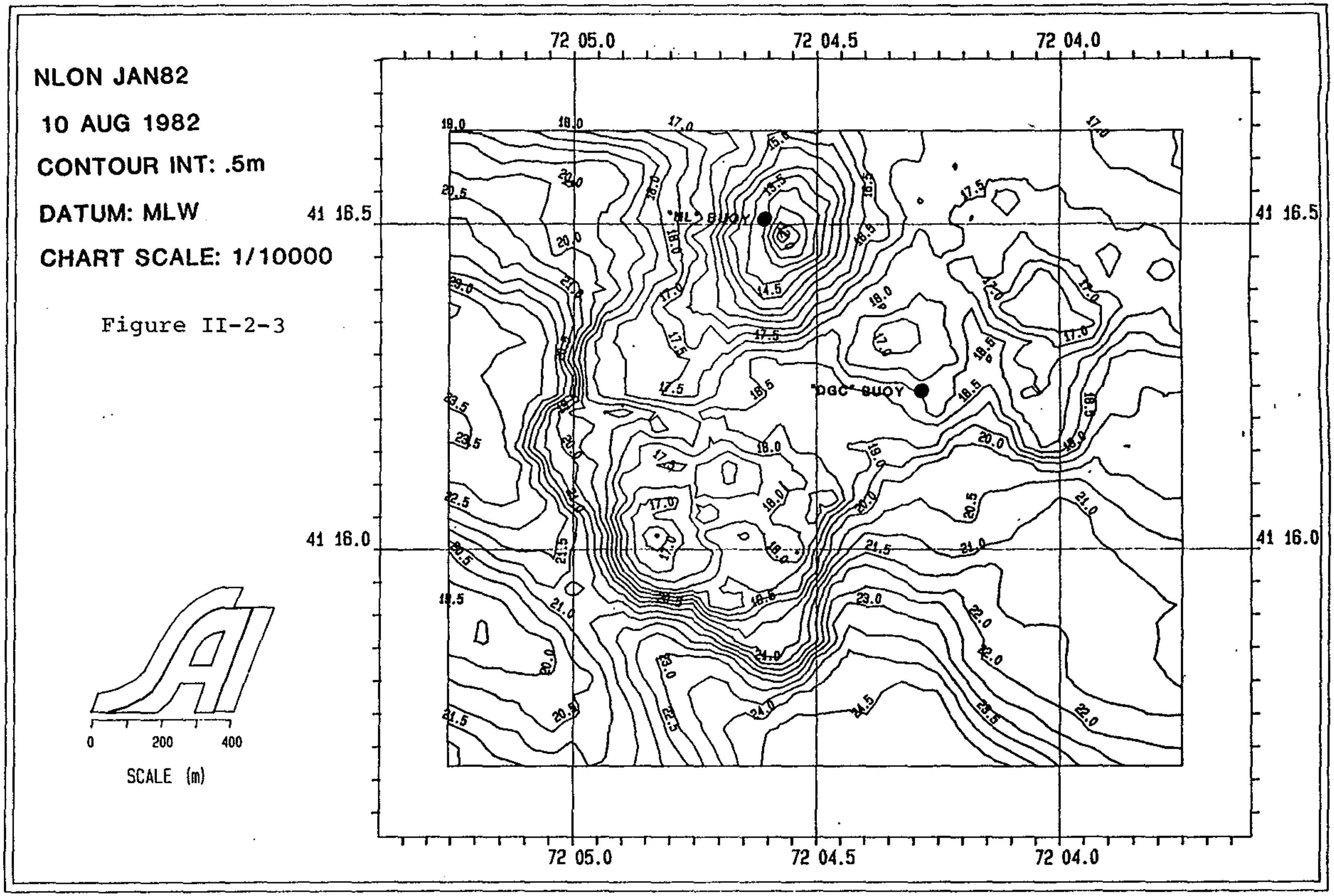
SCALE: 1/10000

Figure II-2-2

0 200 400

SCALE (m)





NLON JAN82
10 AUG 1982
CONTOUR INT: .5m
DATUM: MLW
CHART SCALE: 1/10000
72 05.0
72 04.5
72 04.0
41 16.5
41 16.0
"NL" BUOY
"DGC" BUOY
0
200
400
SCALE (m)

Figure II-2-3

1982, no major operations were conducted at New London and small permit projects were dumped at a "NL" marker buoy installed at the point shown in Figure II-2-3 in the vicinity of the older disposal mound. This practice continued until December 1983, when a submarine ran aground at the site while transitting to the sub base in Groton. In order to determine the extent to which shoaling had occurred, a small survey was conducted on 28 December 1983 (see Fig. II-2-1) centered around the "NL" buoy enclosing an 800 meter square area. The resulting contour chart (Fig. II-2-4) revealed that substantial deposition had created a mound with depths in the center of 10 meters or less. Figure II-2-5 is a 3-dimensional view of the disposal site showing the development of a peaked shoal area in the vicinity of the buoy. During January 1984, the large survey was re-run at the New London site (Fig. II-2-6). The results of this survey showed no significant change since January 1982, with the exception of changes evident at the "NL" buoy, indicating the addition of 1-2 meters of material.

In order to correct this situation, a hopper dredge was deployed during the spring of 1984 to remove material from the shoal area. This sediment was deposited at a buoy designated "DGC" at the location shown in Figure II-2-3. Following completion of this operation, an additional survey in June 1984 (Fig. II-2-7) indicated the deposition of approximately 3 meters of dredged material at the "DGC" buoy.

3.0 SEDIMENT CHARACTERISTICS

In August 1982, replicate sediment samples were obtained with a 0.1 m^2 Smith MacIntyre grab sampler at specified distances along the east-west and north-south transects across the large mound at the New London disposal site. The two other dredged material mounds designated as III and IV were also sampled at points north, south, and 350 meters west of center of each mound for III, and along an east-west transect from 500 meters east of center to 450 meters west for IV. Samples were also taken at a location 1,000 meters east of disposal site center and at a reference area. All samples were taken to NED for analysis.

The coarsest material was found at the center of the large site with 5 to 8 percent of fines. The presence of coal and gravel was a definite indicator of dredged material influence. The material at the other sites was predominantly silty clay, although coarser material was found at the 450 meters west station.

The sediment at 1000 meters east was silty sand, but with substantial silt (57% fines). The reference sediment was coarser than at the disposal site consisting of only 20% fines. It appears that all of the New London site and vicinity is influenced by sandy material.

NLON83

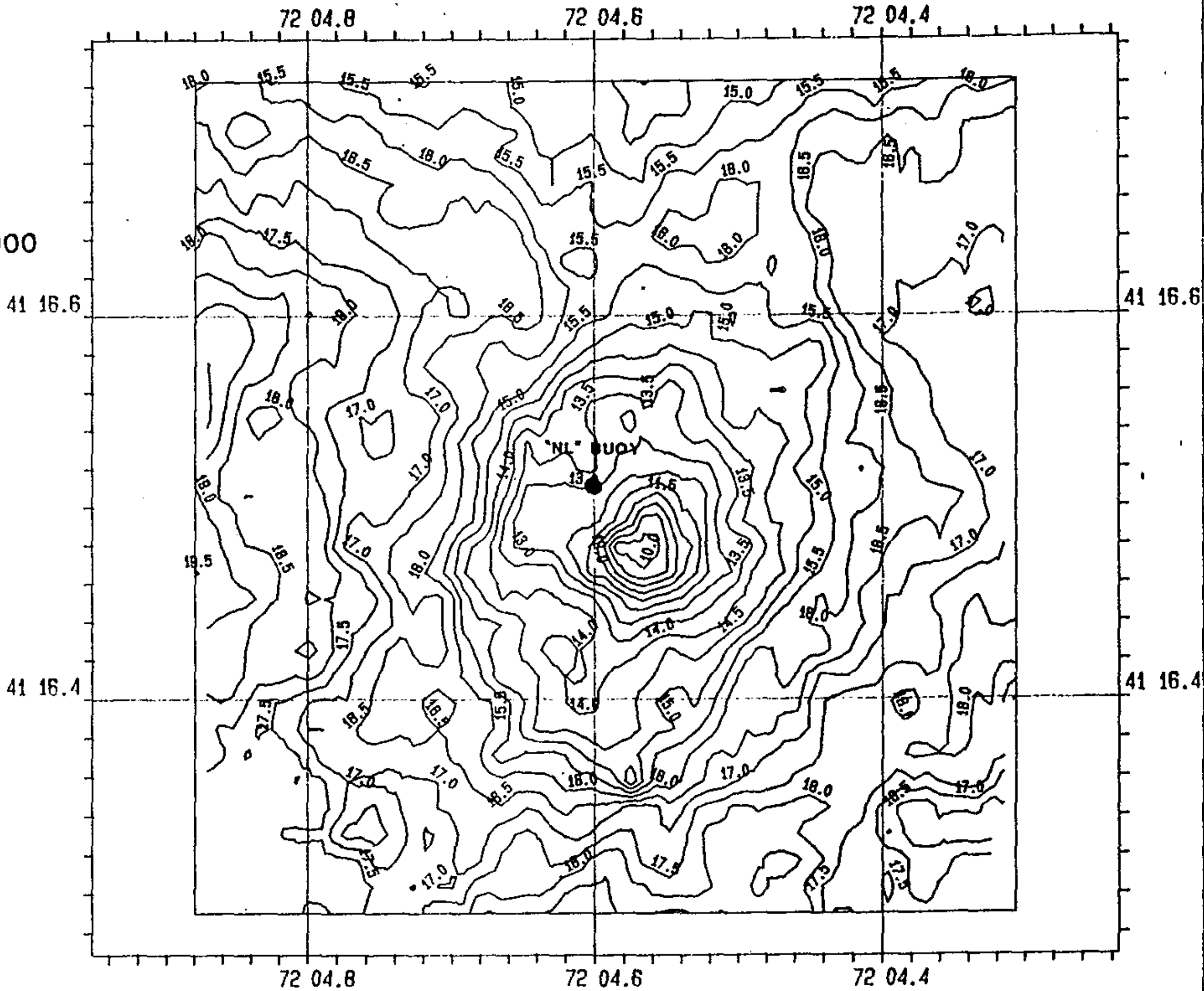
28 DEC 1983

CONTOUR INT: .5m

CHART SCALE: 1/4000

DATUM: MLW

Figure II-2-4



0 80 160

SCALE (m)

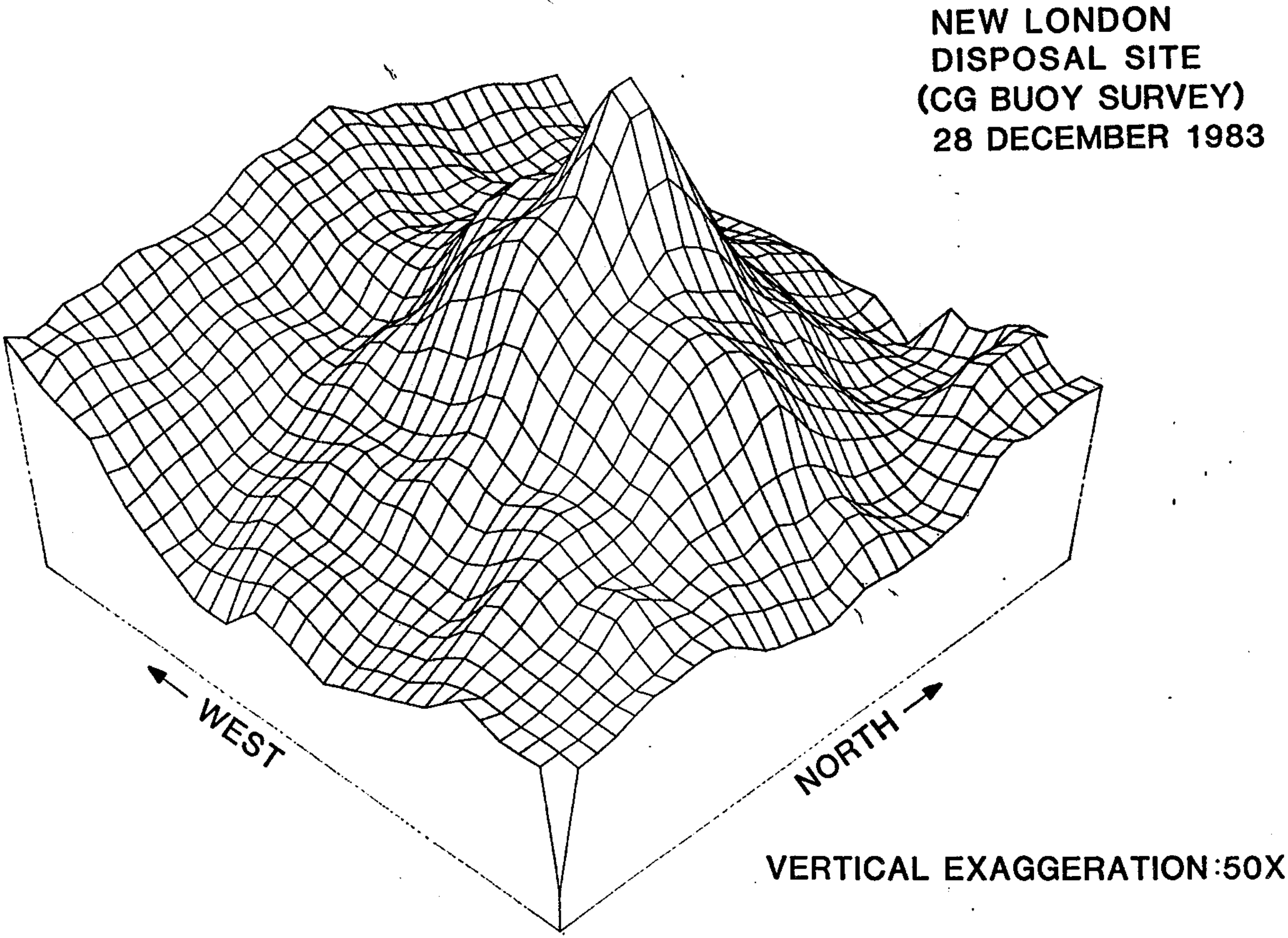


FIGURE II-2-5 Three-dimensioned view of New London Disposal Area.

NLON JAN82

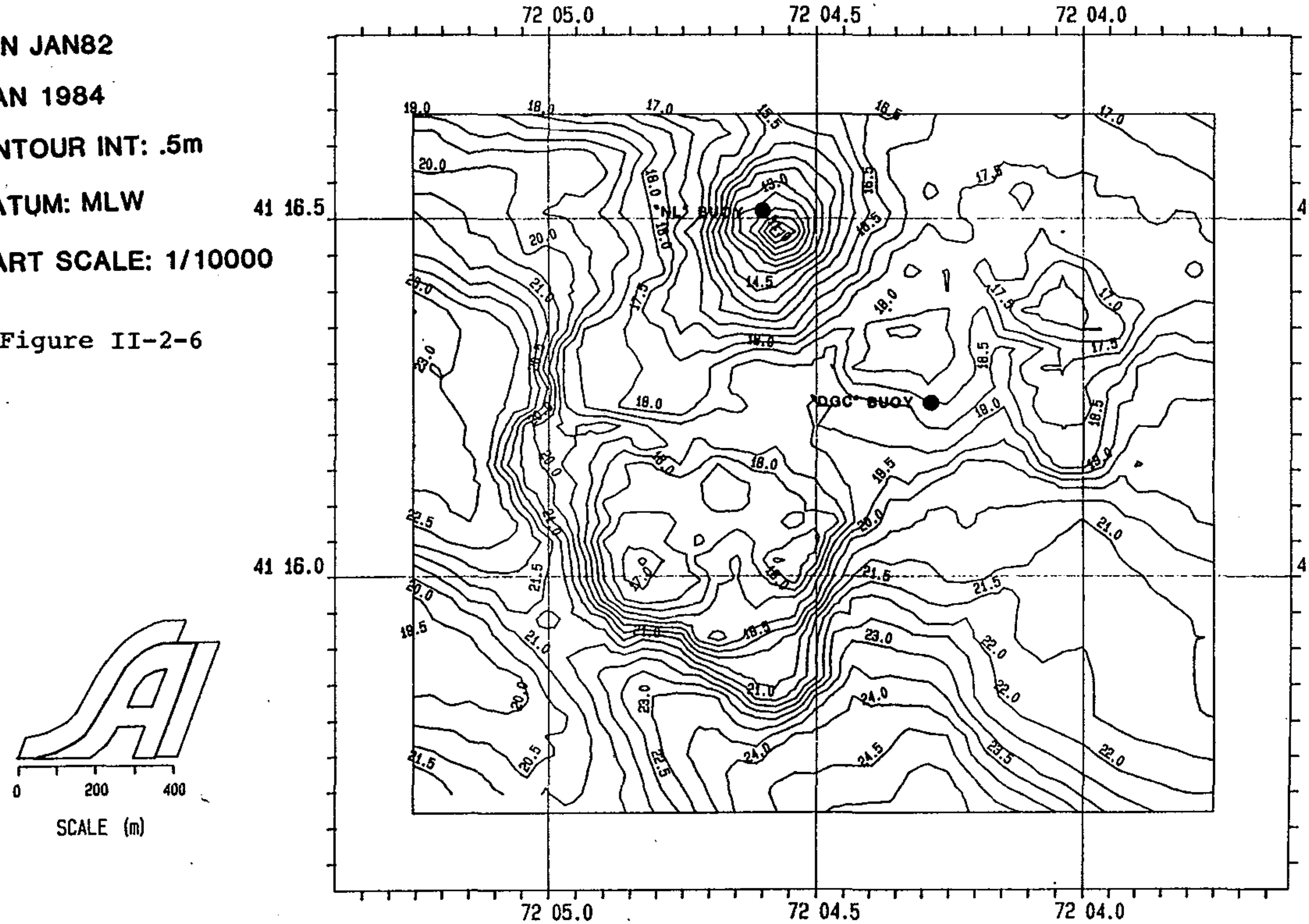
5 JAN 1984

CONTOUR INT: .5m

DATUM: MLW

CHART SCALE: 1/10000

Figure II-2-6



NEW LONDON

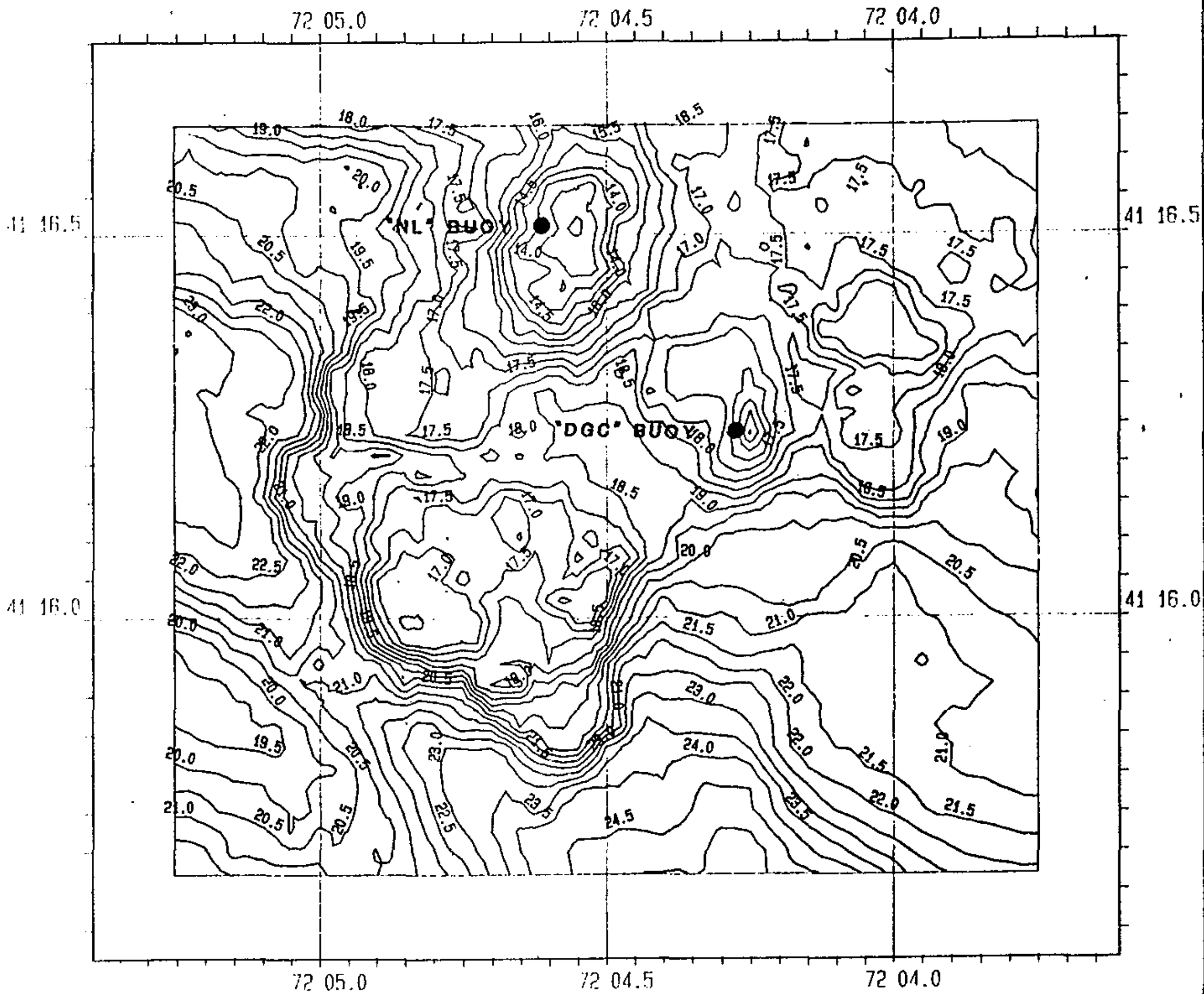
21 JUNE 1984

INTERVAL: 0.5m

SCALE: 1/10,000

DATUM: MLW

Figure II-2-7



0 200 400

SCALE (m)

The sand contribution is evident in the chemical concentrations (Table II-3-1) which are generally lower than those at CLIS or WLIS. The high C:N value, % carbon, and COD concentrations in one of the center replicates could be attributed to the presence of coal which was noted in the visual classification. There are two metal concentrations much higher than the others (Pb in CTR-B and Zn in IV-450W). They were checked and are valid. Such variability is characteristic of dredged material, and these values probably represent a localized outcrop of material with high concentration of heavy metals. There appears to be a correlation between Fe/Cr, COD/Cr, and COD/Pb, but many of the chromium and lead concentrations are too low to be certain. Chemical concentrations in sediment at the disposal site were similar to those at the reference area except for arsenic, which was generally higher at the disposal site. Scattered higher concentrations of ammonia were most likely local concentrations of decayed vegetation and organisms.

In summary, the exposed sediment at the New London site is generally low in contaminant concentration. Any highly contaminated sediment dredged from dockage areas appears to be fully covered by the less contaminated material from the remainder of the river.

In January 1984, sediment cores were taken at five locations near the "NL" buoy (50 meters west, 25 meters west, center, 25 meters east, and 50 meters east). The sampling was accomplished by use of a gravity corer with controlled free-fall. These cores were extruded from the plastic liners and placed in trays for visual observations, the results of which are shown in Table II-3-2. After visual observations, material from selected depth ranges of interest were removed from the cores and underwent physical testing and classification by the NED Materials Laboratory. These tests were used to determine the type of material present within the depth ranges where dredging by the hopper dredge would occur, but represent typical dredged material deposited at the site.

The results presented in Table II-3-3 generally indicate considerable mixing and changes in matrix throughout the sampling area. The physical tests showing silt and sand samples having mixtures of coarser material along with darker color materials is evidence of dredged material mixing during disposal. These sediments were compared to surface grab samples collected in 1982 from the center inner edge, outer edge, and reference locations for the New London dumpsite.

The results of 1982 physical tests are presented in Table II-3-4. In general, these sediments show the same high variability, although the center station is substantially coarser than any other deposits found within the disposal site.

Table II-3-1

Sediment Chemistry, August 1982

Interpretation of Data
New London Disposal Site
North-South Transect
Summer Cruise - August 1982

Location	Sample Type	% Volatile Solids NED	C:N	NH_3 ppm	ppmx10^{-5} COD	ppmx10^{-4} Fe	ppm Pb	ppm As	ppm Zn	ppm Cr	ppm Cu	ppm Mg	ppm Ca	Mg:Ca
400N-A	sandy	2.20	-	11	0.24	1.65	49	6.1	118	19	25	4,880	2,280	2.1
B	silty	2.04	12.0	7	0.27	1.33	41	4.0	208	17	51	3,500	860	4.1
C	clay	2.35	12.9	11	0.25	1.39	127	*	131	34	19	3,860	2,230	1.7
200N-A	sandy	3.11	-	3	0.24	1.61	*	*	83	18	14	4,970	975	5.1
B	silty	4.11	12.4	7	0.40	1.83	41	4.5	91	24	18	5,540	840	6.6
C	clay	1.98	8.1	7	0.27	1.36	31	5.2	117	*	25	4,290	3,680	1.2
CTR-A	fine	3.54	-	5	0.93	0.73	118	*	62	*	19	1,620	1,610	1.0
B	sand	2.98	56.9	7	1.28	0.87	373	4.1	90	*	34	1,890	930	2.0
C		2.69	-	5	0.34	0.91	71	7.2	107	15	30	2,450	1,520	1.6
400S-A	sandy	3.17	13.5	5	0.38	1.54	*	7.1	77	22	12	4,830	3,350	1.4
B	silty	2.95	13.6	19	0.39	1.49	*	8.9	49	18	10	4,490	4,060	1.1
C	clay	3.34	12.8	26	0.39	2.45	*	1.2	88	28	16	7,940	1,220	6.5
600S-A	silty	1.42	-	4	0.20	0.77	*	3.7	74	*	12	2,490	6,800	0.4
B	fine	1.02	-	9	0.16	0.67	*	3.8	71	*	11	2,120	11,600	0.2
C	sand	1.14	-	8	0.07	0.69	*	4.3	62	*	11	2,190	11,600	0.2
1000E-A	silty	2.33	13.3	56	0.25	1.07	37	1.5	101	*	18	3,340	4,240	0.8
B	fine	1.98	11.0	6	0.23	1.12	*	1.7	71	*	17	3,590	1,730	2.0
C	sand	2.06	-	7	0.15	0.88	*	2.7	124	*	12	2,740	2,160	1.7
REF-A	silty	0.86	-	4	0.45	0.58	*	1.0	45	*	*	1,840	2,270	0.8
B	fine	1.26	-	10	0.47	0.65	34	2.8	110	*	*	2,070	1,590	1.3
C	sand	0.88	-	100	0.50	0.64	34	*	78	*	*	2,070	2,150	1.0

*Below minimum detection limit.

Table II-3-1 cont.

Interpretation of Data
New London Disposal Site
East-West Transect
Summer Cruise - August 1982

Location	Sample Type	% Volatile Solids NED	C:N	NH_3 ppm	ppmx10^{-5} COD	ppmx10^{-4} Fe	ppm As	ppm Pb	ppm Zn	ppm Cr	ppm Cu	ppm Mg	ppm Ca	Mg:Ca
600E-A	sandy	2.72	12.3	58	0.42	2.12	6.7	34	86	29	22	6,430	720	8.9
B	silty	2.70	10.8	8	0.48	2.12	3.7	47	146	27	21	6,870	910	7.5
C	clay	3.28	12.1	5	0.67	2.22	2.1	41	78	30	20	7,270	980	7.4
300E-A	silty	3.41	17.2	9	0.59	1.49	5.9	40	117	23	18	4,400	290	15.1
B	clayey	3.25	14.6	16	0.71	1.34	5.2	77	166	21	32	3,820	280	13.6
C	sand	2.87	16.6	6	0.52	1.55	1.8	50	74	27	18	4,950	1,040	4.8
CTR-A	fine	3.54	-	5	0.93	0.73	*	118	62	*	19	1,620	1,610	1.0
B	sand	2.98	56.9	7	1.28	0.87	4.1	373	90	*	34	1,890	930	2.0
C		2.69	-	5	0.34	0.91	7.2	71	107	15	30	2,450	1,520	1.6
300W-A	sandy	2.99	13.3	9	0.22	1.11	3.1	38	79	16	20	3,580	10,900	0.03
B	silty	0.88	-	4	0.05	0.71	1.8	50	108	*	14	2,320	16,300	0.14
C	clay	4.01	12.1	19	0.50	2.02	3.7	*	67	24	11	6,600	7,650	0.9
600W-A	sandy	2.53	10.5	7	0.42	1.76	*	53	105	20	17	5,490	3,120	1.8
B	silty	3.01	10.4	9	0.57	2.07	1.7	39	124	27	16	6,460	540	12.0
C	clay	3.25	10.8	3	0.57	2.00	*	60	112	30	25	6,220	1,240	5.0
1000E-A	silty	2.33	13.3	56	0.25	1.07	1.5	37	101	*	18	3,340	4,240	0.8
B	fine	1.98	11.0	6	0.23	1.12	1.7	*	71	*	17	3,590	1,730	2.0
C	sand	2.06	-	7	0.15	0.88	2.7	*	124	*	12	2,740	1,760	1.7
REF-A	silty	0.86	-	4	0.45	0.58	1.0	*	45	*	*	1,840	2,270	0.8
B	fine	1.26	-	10	0.47	0.65	2.8	34	110	*	*	2,070	1,590	1.3
C	sand	0.88	-	100	0.50	0.64	*	34	78	*	*	2,070	2,150	1.0

*Below minimum detection limit.

Table II-3-1 cont.

Interpretation of Data
New London Disposal Site - Mound III
Summer Cruise - August 1982

Location	Sample Type	% Volatile Solids NED	C:N	NH_3 ppm	ppmx10^{-5} COD	ppmx10^{-4} Fe	ppm As	ppm Pb	ppm Zn	ppm Cr	ppm Cu	ppm Mg	ppm Ca	Mg:Ca
III-N-A	sandy	3.58	9.7	6	0.47	1.33	1.5	36	113	20	20	4,440	2,370	1.9
B	silty	1.70	-	8	0.30	1.59	5.7	*	98	20	15	4,830	830	5.8
B	clay	2.51	10.8	7	0.29	1.41	3.7	*	102	20	22	4,570	1,630	2.8
III-CTR-A	sandy	2.78	10.3	12	0.33	2.21	1.3	46	102	30	22	7,220	1,440	5.0
B	clayey	3.54	10.4	82	0.44	2.12	1.6	55	128	29	24	6,960	1,380	5.0
C	silty	1.57	11.4	5	0.35	1.76	5.6	39	76	21	16	5,660	1,580	3.6
III-S-A	sandy	3.22	11.2	9	0.46	2.29	8.9	37	96	26	17	7,330	1,070	7.0
B	silty	3.79	10.6	73	0.51	2.43	6.4	55	103	27	19	7,450	950	7.8
C	clay	3.62	12.8	6	0.50	2.41	8.6	46	121	27	18	8,060	6,380	1.3
III-350W-A	sandy	3.08	11.1	15	0.45	2.10	1.2	52	66	23	18	6,830	1,230	5.6
B	silty	3.57	10.7	30	0.45	1.91	2.0	53	69	20	19	6,270	6,650	0.9
C	clay	3.45	12.8	12	0.45	2.11	1.2	60	111	23	25	6,980	1,840	3.8
1000E-A	silty	2.33	13.3	56	0.25	1.07	1.5	37	101	*	18	3,340	4,240	0.8
B	fine	1.98	11.0	6	0.23	1.12	1.7	*	71	*	17	3,590	1,730	2.0
C	sand	2.06	-	7	0.15	0.88	2.7	*	124	*	12	2,740	1,760	1.7
REF-A	silty	0.86	-	4	0.45	0.58	1.0	*	45	*	*	1,840	2,270	0.8
B	fine	1.26	-	10	0.47	0.65	2.8	34	110	*	*	2,070	1,590	1.3
C	sand	0.88	-	100	0.50	0.64	*	34	78	*	*	2,070	2,150	1.0

*Below minimum detection limit.

Table II-3-1 cont.

Interpretation of Data
New London Disposal Site - Mount IV
Summer Cruise - 1982

Location	Sample Type	% Volatile Solids NED	C:N	NH_3 ppm	ppmx10^{-5} COD	ppmx10^{-4} Fe	ppm As	ppm Pb	ppm Zn	ppm Cr	ppm Cu	ppm Mg	ppm Ca	Mg:Ca
IV-500E-A	sandy	2.07	10.7	52	0.48	1.64	0.8	38	100	23	27	5,260	2,110	2.5
B	clayey	2.49	10.1	25	0.42	1.76	0.7	*	112	25	32	5,660	1,540	3.7
C	silt	2.46	11.2	26	0.36	1.79	1.1	*	108	25	23	5,720	996	5.7
IV-CTR-A	silty	1.88	13.8	35	0.40	1.55	1.3	*	104	19	17	4,800	5,890	0.8
B	clay	3.19	10.9	8	0.63	2.48	3.5	*	122	39	25	7,840	1,020	7.7
C		3.23	10.1	14	0.67	2.11	2.6	54	81	29	24	7,060	1,280	6.9
IV-150W-A	sandy	2.05	12.2	9	0.42	1.70	1.5	*	68	23	20	5,470	1,830	3.0
B	silty	2.35	11.2	8	0.41	1.92	1.4	*	74	25	19	6,270	1,920	3.3
C	clay	2.64		8	0.60	2.03	1.9	30	99	27	20	6,880	7,680	0.9
IV-450W-A	silty	1.12	-	6	0.19	1.00	0.9	*	63	17	14	3,620	6,350	0.6
B	med to	1.11	10.9	8	0.18	1.09	0.9	*	87	18	17	3,550	4,090	0.9
C	fine	2.84	15.2	10	0.61	1.17	1.2	*	398	22	36	3,760	3,870	1.0
	sand													
1000E-A	silty	2.33	13.3	56	0.25	1.07	1.5	37	101	*	18	3,340	4,240	0.8
B	fine	1.98	11.0	6	0.23	1.12	1.7	*	71	*	17	3,590	1,730	2.0
C	sand	2.06	-	7	0.15	0.88	2.7	*	124	*	12	2,740	1,760	1.7
REF-A	silty	0.86	-	4	0.45	0.58	1.0	*	45	*	*	1,840	2,270	0.8
B	fine	1.26	-	10	0.47	0.65	2.8	34	110	*	*	2,070	1,590	1.3
C	sand	0.88	-	100	0.50	0.64	*	34	78	*	*	2,070	2,150	1.0

*Below minimum detection limit.

Table II-3-2

Visual Observations

1. Station - 50 meters west
Total length 2.0 ft
0.0'-0.18' - gray sand - clay mix
0.18'-1.0' - clay with pockets of shell fragments
1.0'2.0' - sand and clay, shell fragments

2. Station - 25 meters west
Total length - 2.25 ft
Uniform throughout, gray clay with shell fragments, trace of cobbles, no odor

3. Station - Center of mound
Total length - 2.5 ft, distinct, uniform layers
0.0'-0.6' - coarse to medium sand
0.6'-1.1' - sand-clay matrix, cobbles, and gravel
1.1'-1.5' - medium to fine sand
1.5'-2.2' - gray clay
2.2'-2.4' - black sand and gravel, oil odor
2.4'-2.5' - gray clay

4. Station - 25 meters east
Total length - 2.3 ft
0.0'-1.5' - silt, come fine sand, uniform mix, very compact, breaks into large clumps, no odor, no shells
1.5'-2.3' - Black sand, little silt, trace cobbles, clay clumps oil odor

5. Station - 50 meters east
Total length - 2.5'
0.0'-1.0' - well graded sand some silt
1.0'-1.3' - black sand and gravel - marine odor (sulfide), trace cobbles shell fragments
1.5'-bottom - Gray clay, little fine sand, uniform mix, no shells, slight odor

Table II-3-3

Sediment Characteristics, February 1984

NEW ENGLAND DIVISION, CORPS OF ENGINEERS
RESULTS OF PHYSICAL TESTING - DAMOS

New London Disposal Site
Core Samples - February 1984

Test	Sample Locations (meters) and depth range (ft)			
	25 east 0.0-1.50	25 east 1.8-2.3	50 east 1.0-1.3	50 east 1.5-2.9
Classification	Dark grey organic sandy clayey silt (OH) and marine odor	Grey gravelly silty coarse to fine sand (SM) with shell fragments marine odor	Dark grey silty gravelly coarse to fine sand(SW-SM) w/shell fragments marine odor	Dk grey organic sandy clayey silt (OH) w/shell fragments marine odor
Grain Size Curve				
Med (50)	0.0500	0.2800	0.8500	0.0120
Q1 (75)	0.1200	1.5000	3.200	0.0290
Q3 (25)	0.0200	0.0900	0.2700	0.0035
Soil Class/ Dominant	OH	SM	SW-SM	OH
Normal/ Bimodal	B	N	N	N
% Fines: (pass #200 US Std Sieve)	50	20	12	90
Specific Gravity	2.70	2.70 2.50 (-#200)		2.62
Total Length of Core, ft		2.3		2.9

Table II-3-3 cont.

NEW ENGLAND DIVISION, CORPS OF ENGINEERS
RESULTS OF PHYSICAL TESTING - DAMOS

New London Disposal Site
Core Samples - February 1984

Test	Sample Locations (meters) and depth range (ft)				
	50 west 0.25-1.0	50 west 1.10-1.75	25 west 0.0-2.25	0.6-1.1 CTR	1.6-2.1 CTR
Classification	Dark grey organic sandy clayey silt (OH) w/shell fragments and marine odor	Dark grey silty m-f sand (SM) with trace of gravel w/shell frags and marine odor	Dk grey organic sandy silty clay (OH) with shell fragments and marine odor	Dk grey silty coarse to fine sand w/shell fragments (SM) marine odor	Dark grey organic sandy clayey silt (OH) w/shell fragments and marine odor
Grain Size Curve					
Med (50)	0.0700	0.2200	0.0130	0.0800	0.0130
Q1 (75)	0.1500	0.5000	0.1500	0.4500	0.1500
Q3 (25)	0.0070	0.0800	0.0022	0.0180	0.0025
Soil Class/ Dominant	OH	SM	OH	SM	OH
Normal/ Bimodal	N	N	N	N	N
% Fines: (pass #200 US Std Sieve)	50	22	68	48	70
Specific Gravity	2.69	2.55 (-#200)	2.69	2.68	2.72
Total Length of Core, ft		1.8	2.25		2.5

Table II-3-4

Sediment Characteristics, August 1982

	Inner Edge	CTR	Outer Edge	Reference
Classification	sandy silty clay (OH)	dk grey medium to fine sand (SM) to med-fine sand (SW-SP) w/trace gravel	silty fine sand (SM) to sandy silty clay (OH)	silty fine sand (SM)
grain size (mm)				
at med (50% finer)	0.014-0.070	0.250-0.350	0.045-0.076	0.095-0.120
at Q1 (75% finer)	0.028-0.093	0.450-0.600	0.078-0.160	0.130-0.150
at Q3 (25% finer)	0.0040-0.0120	0.100-0.180	0.014-0.067	0.074-0.095
% fines (Pass #200 U.S. Std Sieve)	73-93	5-22	48-75	10-23

4.0 REMOTS

On 22 June 1984, a baseline REMOTS survey was conducted to evaluate successional stage, depth of redox potential discontinuity and benthic index at four separate dredged material disposal points in the New London disposal site and to compare parameters in the disposal site with those of the ambient bottom. The four disposal sites are of different age, ranging from more than ten years to less than one year; this survey therefore offers a unique opportunity to evaluate an area in which sections of the bottom may be at various stages of faunal recovery.

A total of 51 stations were occupied and two replicate images were taken at each station, with the exception of the New London Reference Station, where four replicate images were taken.

These fifty-one stations were divided between five separate orthogonal sampling grids (Fig. II-4-1). Nine stations were located on the NL site sampling grid. This is the northernmost site where disposal of dredged material took place more than ten years ago. Nine stations were located on the NLON sampling grid, southwest of the DGC site, where disposal occurred between 1977 and 1979. The sampling grid at the NL III site, to the east of the NL site, contains thirteen stations. Dredged material disposal occurred at the NL III site in 1980. Ten stations were located on the DGC sampling grid, where material from the NL site was dredged and redeposited in 1984. Nine stations were located on the SE Reference sampling grid, outside of the New London disposal area.

4.1 Results

4.1.1 NL Site

Grain-size major modes at the NL site are generally in the silt to very fine sand classes ($>4-3\phi$), with ranges extending into fine and medium sand ($3-1\phi$). At some stations, this larger-grain component is substantial. Stations 100W and CTR consist of surface layers of fine to medium sand on top of silt layers (Fig. II-4-2). Stations 100E and 100N show patches of coarse-grained sediment at the surface, and the dominant grain-size mode of one replicate at station 100S is $3-2\phi$ (fine sand). Washing of the fine-grained component of the sediment may have occurred during recent dredging operations in the central portion of this sampling grid, delineated in Figure II-4-3. An alternative explanation is that surface sand layers represent sedimentary intervals of relatively coarse-grained dredged material resuspended during the hopper dredging operations.

Apparent patches or layers of dredged material occur at stations 300W, 100W, 100N, and 100E. Material layers range from a mean depth of 10.5 cm at station 100N to 3.6 cm at station 100W. At all stations where dredged material is present, extensive recolonization of the surface has apparently occurred, indicated by relatively deep RPD's and the presence of high-order successional seres.

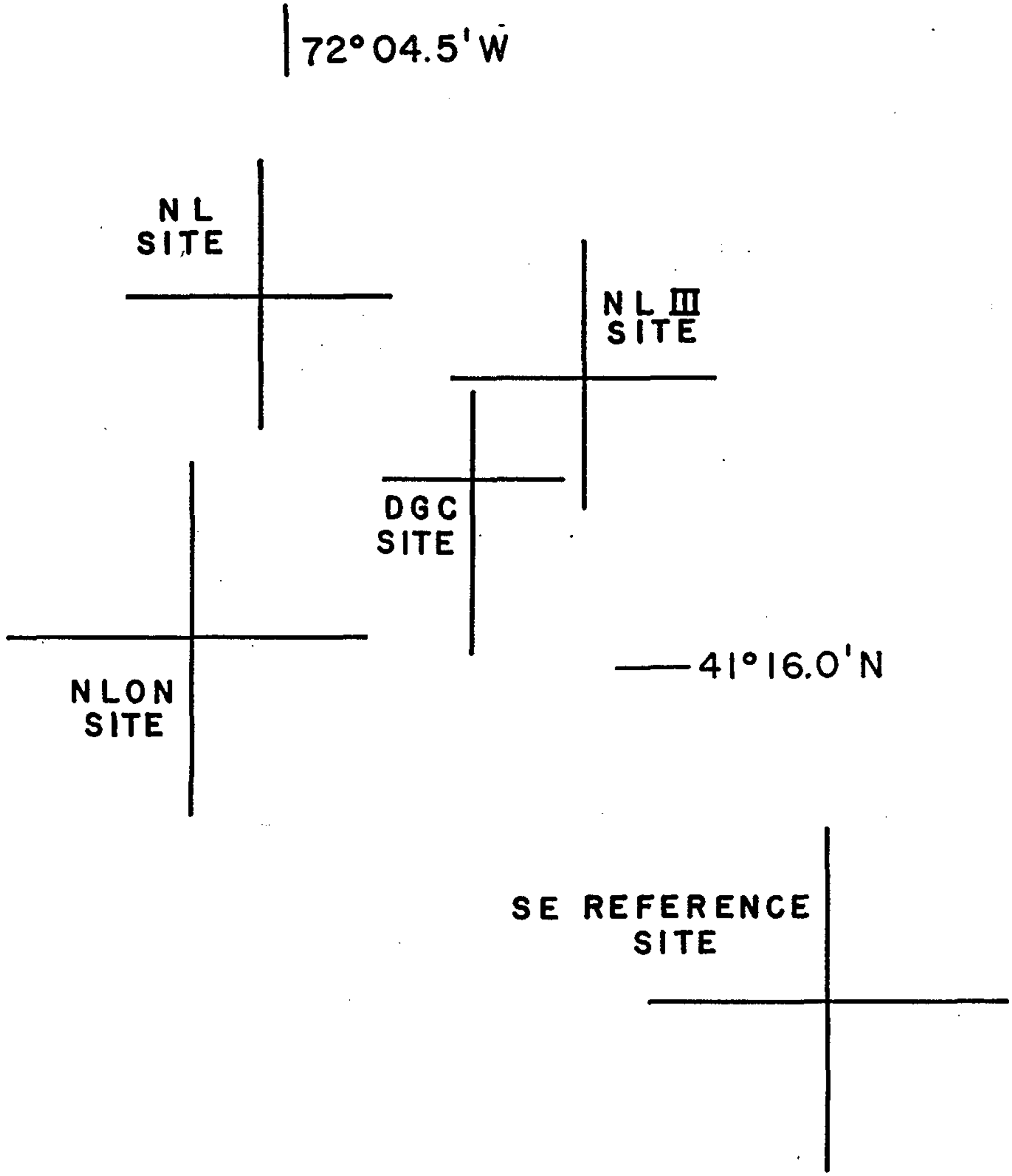


FIGURE II-4-1 Map of the relative locations of the five orthagonal grids sampled in this survey.

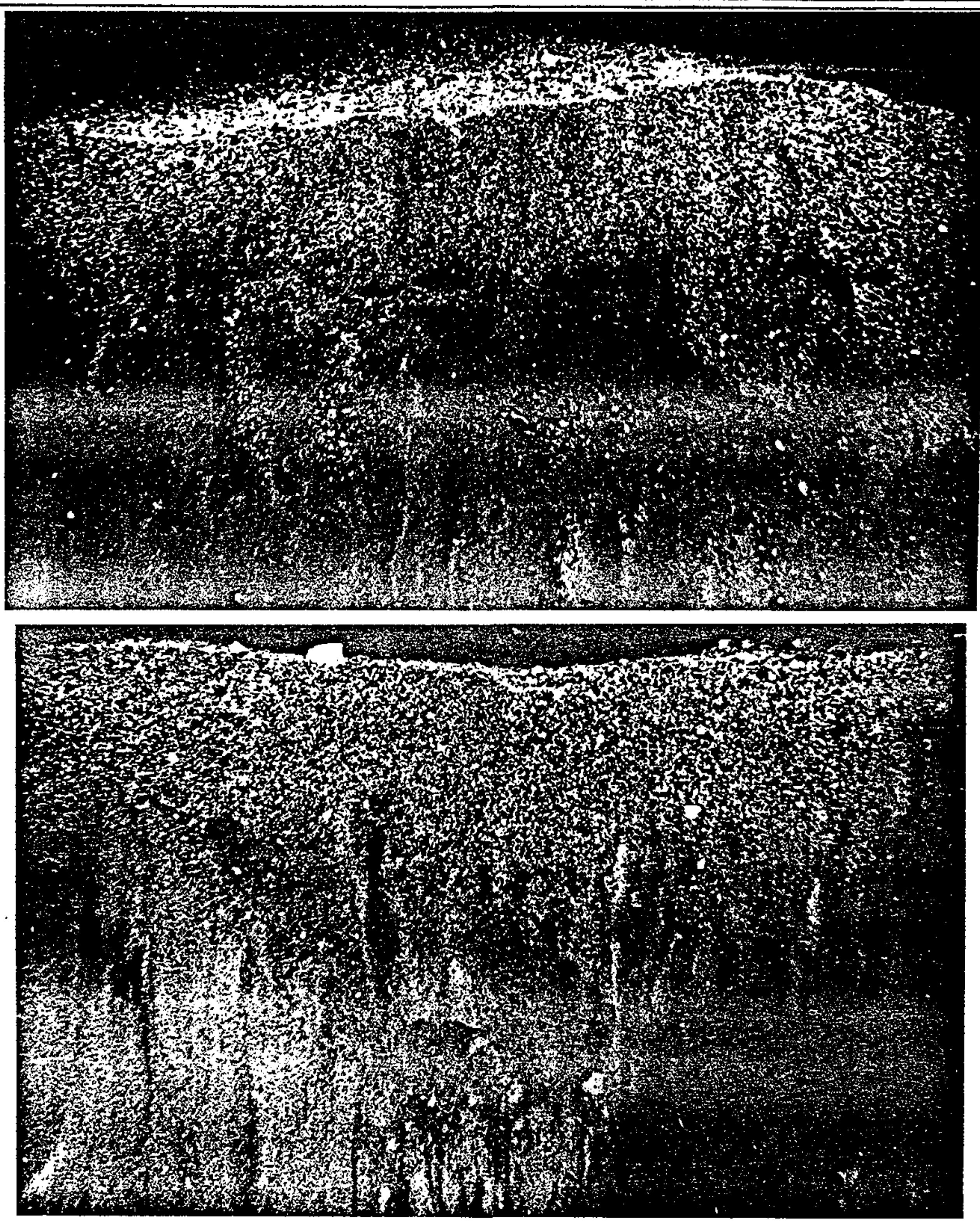


Figure II-4-2. REMOTS images from the New London disposal site showing surface layers of coarse sediment (3-1 ϕ) overlaying silt-very fine sand (<4-3 ϕ) at station 100W NL site and 100E DGC site.

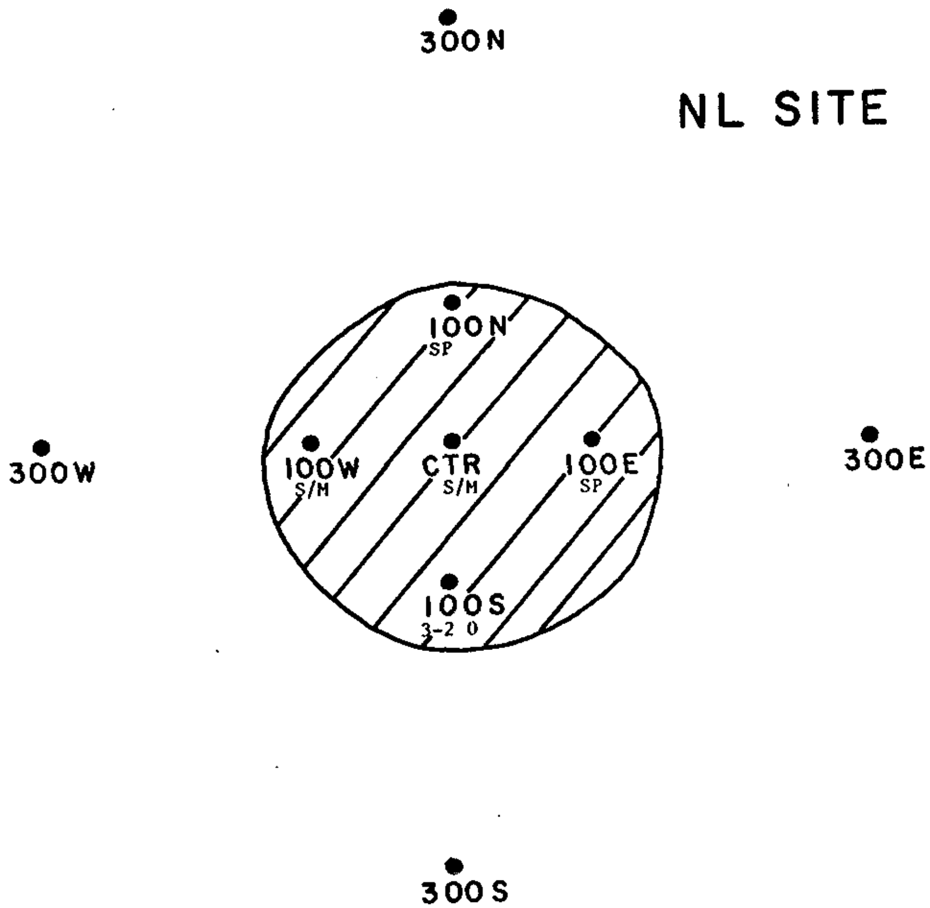


FIGURE II-4-3. Map showing central area of the NL site, where surface sand layers suggest coarse-grained lag deposit resulting from dredging operation.

Figure II-4-4 shows station means for RPD depths at the NL site. Station means range from 2.11 cm at station 300W to 8.23 cm at station 100N. There is no apparent correlation between RPD depth and dredged material distribution, or any other physical parameter. Figure II-4-5 shows the frequency distribution of RPD depths for this site. Replicates from stations 300N, 300E, 100S, and 300S are not included in this histogram, either because of inadequate penetration of the optical prism, or because the RPD depth is greater than the prism penetration depth, and therefore only a minimum RPD depth can be established. RPD depths show a wide distribution, with a major mode in the 2.1 - 3.0 cm class. However, the sample size (n=9) is too small to characterize this distribution with certainty.

Figure II-4-6 shows the mapped distribution of successional stage for each station replicate at the NL site. A patchy mixture of Stage I, Stage III, and Stage III-I seres are present, although characterization of successional stage at stations 300N, 100S, and 300S is uncertain, (prism penetration at these stations was poor, and evidence of higher-order successional seres may have been present at greater depths). A few members of the genus Ampelisca are present in both replicates at station 300W, indicating that this station is transitional between Stage I and Stage II. Hydroids are present at stations 300N, 100S, 300S, and 300W.

Figure II-4-7 shows the mapped distribution of benthic index values for all station replicates from the NL site. Figure II-4-8 shows the frequency distribution of benthic index values for this site. The benthic index could only be established with certainty for replicates where the RPD depth is less than the prism penetration depth, or where the RPD depth is greater than the prism penetration depth and also greater than 3.75 cm, giving the replicate the highest possible RPD depth-rating incorporated by the benthic index. Benthic indices primarily reflect the patchiness of this sampling grid with regard to successional stage. Replicates are divided almost evenly between those with a benthic index in the 4-6 range (n=5) and those with a benthic index of 11 (n=4). There are no apparent spatial trends with regard to benthic index; variations within stations (100W and 100E) are as great as variations between stations.

4.1.2 NL III Site

Replicates from stations 300N, 200N, 100N, 200E and 300E show uniform grain-size distributions, with major modes in the >4-3 ϕ class (silt to very fine sand), and ranges extending into the 2 ϕ and 1 ϕ classes (fine and medium sand). The remainder of the stations, encompassing the western and southern axes of the grid and stations CTR and 100E, have at least one replicate in which patches or layers of relatively fine-grained sediment (>4 ϕ) are found beneath surface layers of coarser material (4-1 ϕ). The grain-size distributions at these stations may indicate the presence of recently-deposited coarse grained dredged material layers.

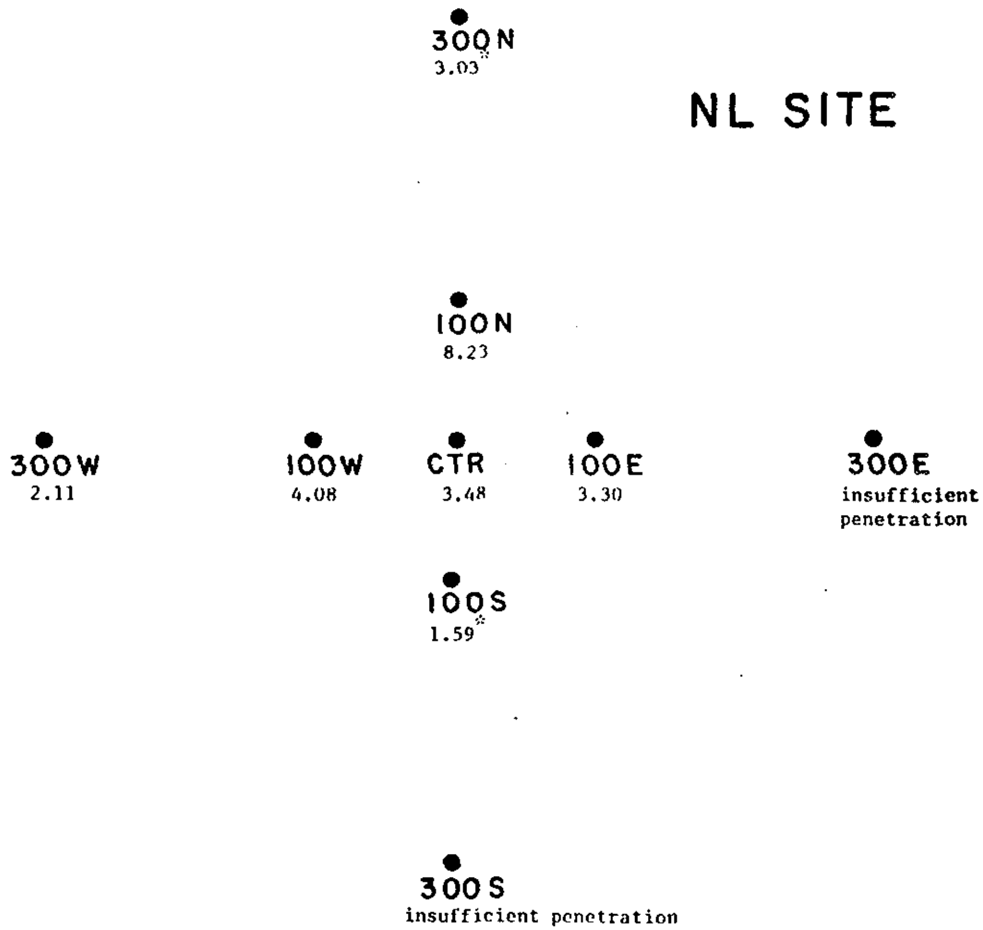


FIGURE II-4-4. Mapped distribution of mean RPD depths for stations in the NL site.

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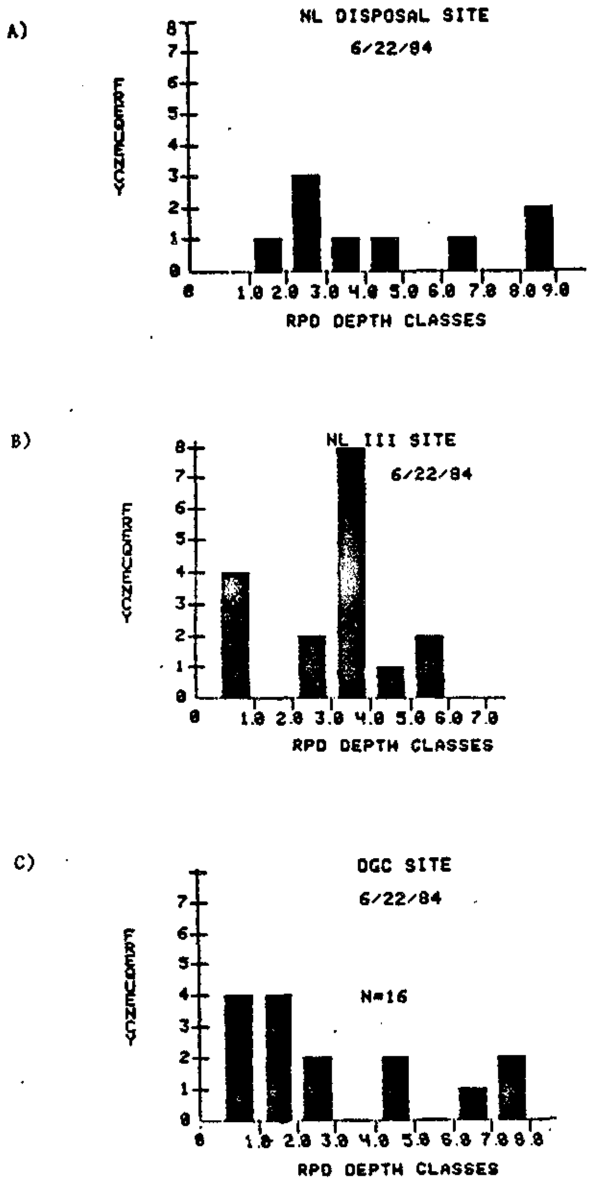

Figure II-4-5. Frequency distribution of RPD depths, excluding replicates for which only a minimum RPD depth could be established. A) NL site, B) NL III site, and C) DGC site.

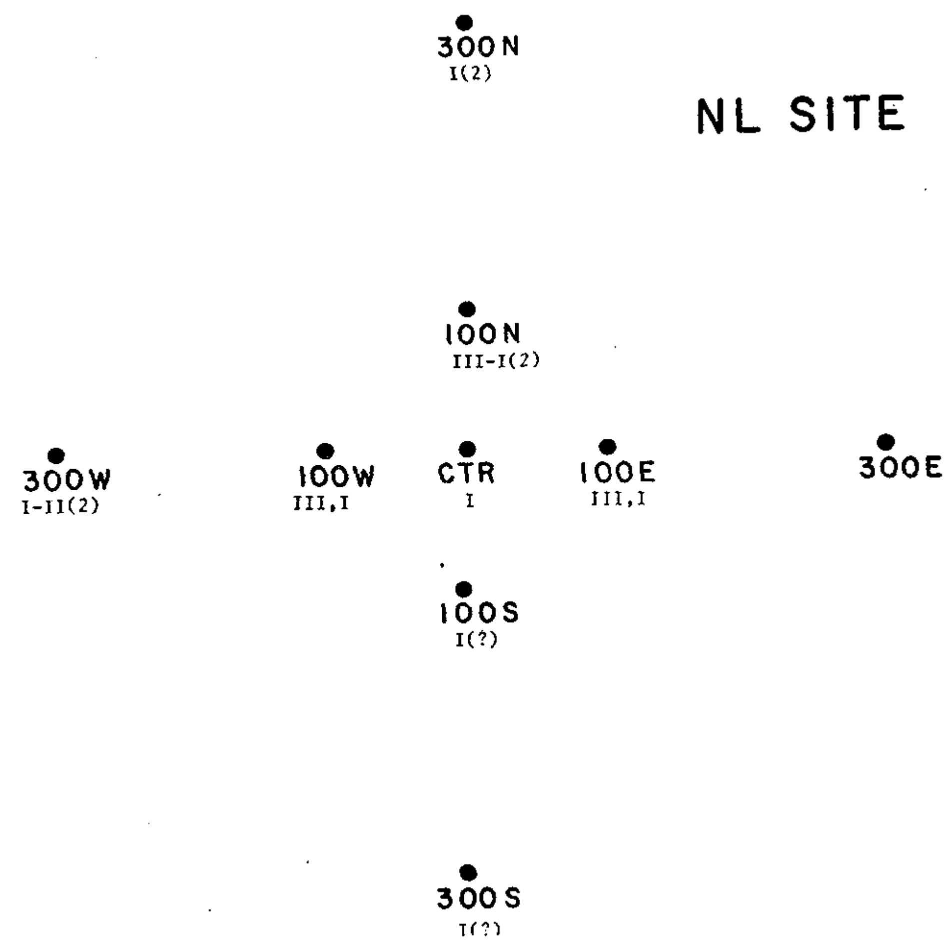

FIGURE II-4-6. Mapped distribution of successional stages for all replicates in which successional stage could be determined in the NL site. The number in parentheses in this and in later figures specifies the number of replicates at the station with a given value.

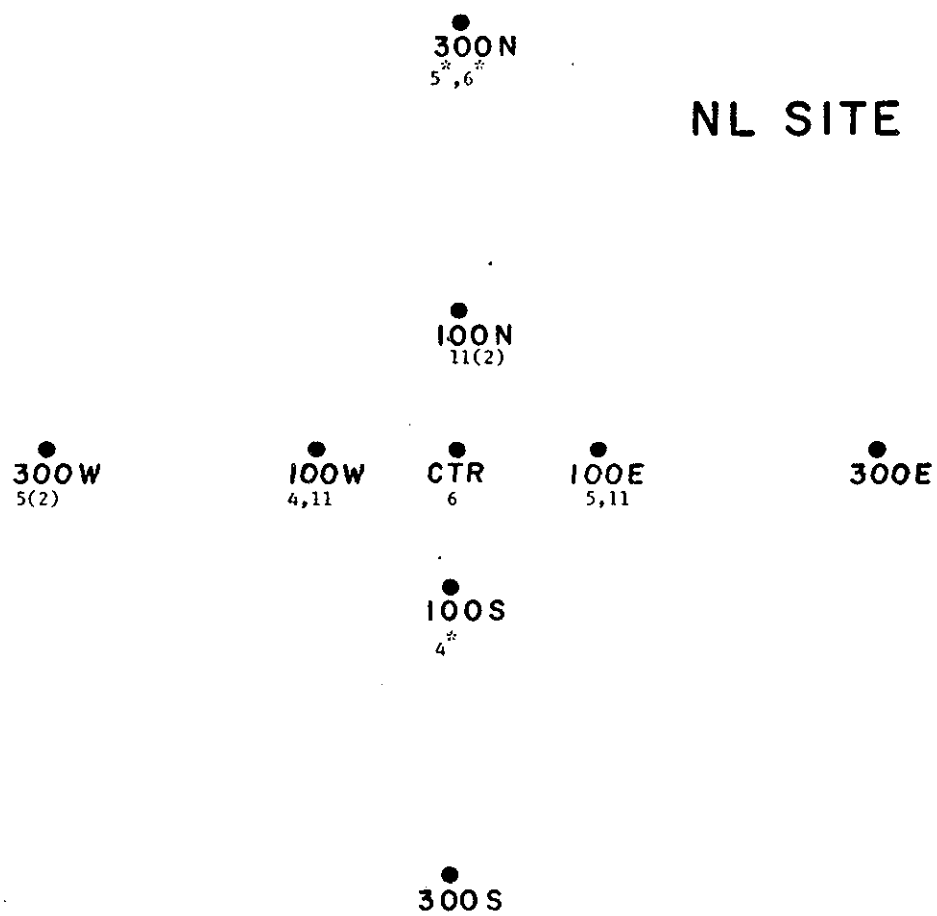

FIGURE II-4-7. Mapped distribution of benthic indices for all replicates in which benthic index could be determined in the NL site. An asterisk indicates a minimum benthic index for the replicate.

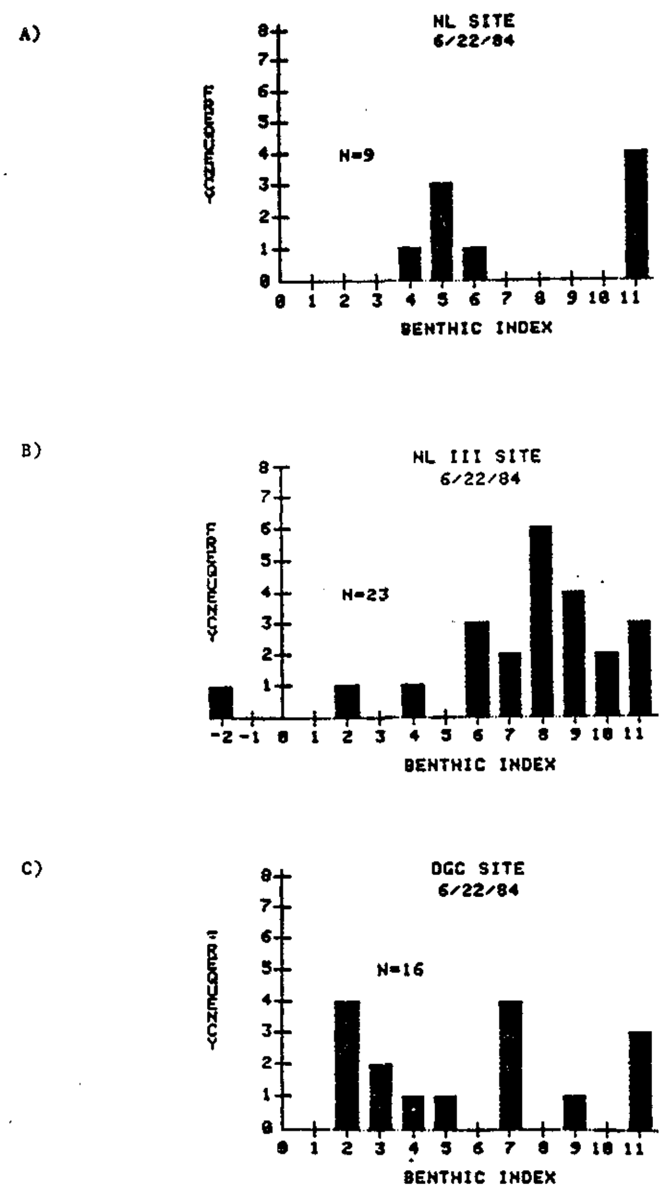

Figure II-4-8. Frequency distribution of benthic indices, excluding replicates for which only a minimum benthic index would be established. A) NL site, B) NL III site, and C) DGC site.

The above supposition is supported by the distribution of dredged material at the NL III site. Apparent dredged material layers are present at 200S, 300S, 200W, and 100W (Fig. II-4-9), and patches of material are present at stations 100S and 100E. Dredged material is not apparent in replicates from the northern and eastern axes of the grid. Particularly in stations 200S and 300S, dredged material deposition appears to have been very recent: the surface aerated layers at these stations are very thin or nonexistent. It is possible that these stations, closest to the DGC site where material was most recently deposited, received dredged material during the DGC site disposal operations.

The mapped distribution of mean RPD depths for stations at the NL III site is shown in Figure II-4-10. Figure II-4-5 shows the frequency distribution for RPD depths at the NL III site. With the exception of stations 300W, 200S, and 300S, all station means for RPD depth are greater than 3.0 cm, ranging from 3.04 cm at station 200N to 6.86 cm at station 200E. Stations 300W, 200S and 300S have mean RPD depths of 2.36 cm, 1.58 cm, and 0.38 cm respectively, and are significantly depressed relative to the rest of the site (X = 4.28 cm). The shallow RPD depths at stations 200S and 300S reflect the presence of dredged material. Deposition of material at these stations appears to have been recent, and very little biological aeration of the surface has occurred. The major mode for RPD depths at the NL III site is the 3.1 - 4.0 cm class. The minor mode occurs at the 0.1 - 1.0 cm class, representing shallow RPD depths in the two southernmost stations.

Figure II-4-11 shows the mapped distribution of successional stages for each replicate in the NL III site. Ampelisca are present in replicates from all stations on the grid with the exception of the three southern stations and station 200W. This genus is characteristic of a Stage II successional sere: most replicates from these stations are either in Stage II, or are transitional between Stage I and Stage II. In the three southern stations, where there is evidence of recent deposition, Ampelisca are not present, and patchy assemblages of Stage I and Stage III predominate. In one replicate from each of the three stations, it appears that, despite burial by recent deposition, Stage III assemblages have remained active.

Figure II-4-12 shows the mapped distribution of benthic indices for all replicates in the NL III site. Figure II-4-8 shows the frequency distribution of benthic indices for this site. There is a wide range of benthic index values at this site, from -2 to 11. Excluding the southern stations and station 300W, benthic indices for most replicates range between 8 and 11. Low benthic index values in one replicate from each of the two southernmost stations (-2 at 200S; 2 at 300S) are attributable to recent deposition of dredged material and thin or nonexistent biologically aerated sediment layers. The same may be true of station 300 W, where one replicate has a benthic index of 4. Although low-reflectance, reduced sediment (usually the criterion

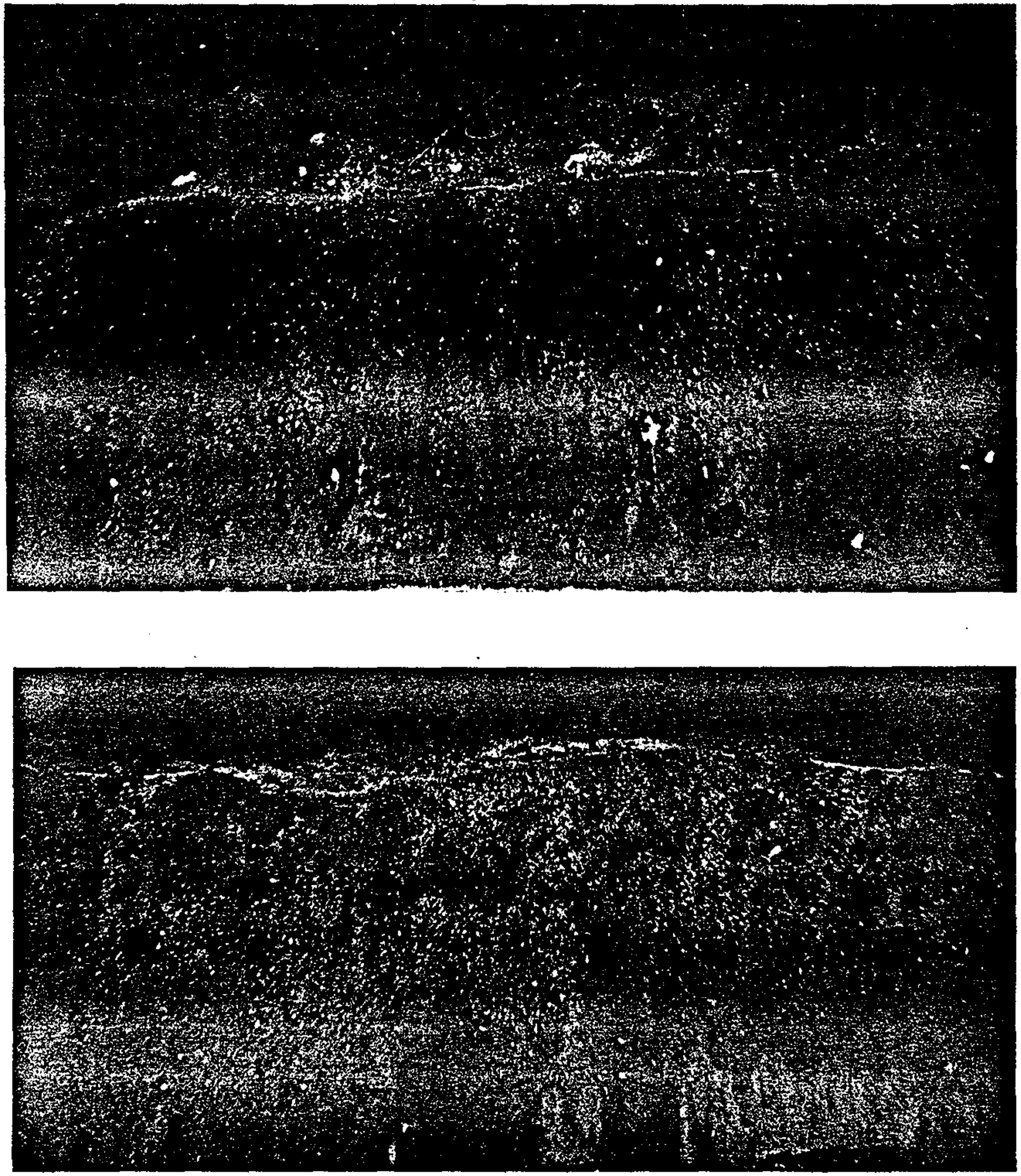

Figure II-4-9. REMOTS images from NL III site showing what appear to be surface layers of recently deposited dredged material. A) station 200S, B) station 300S.

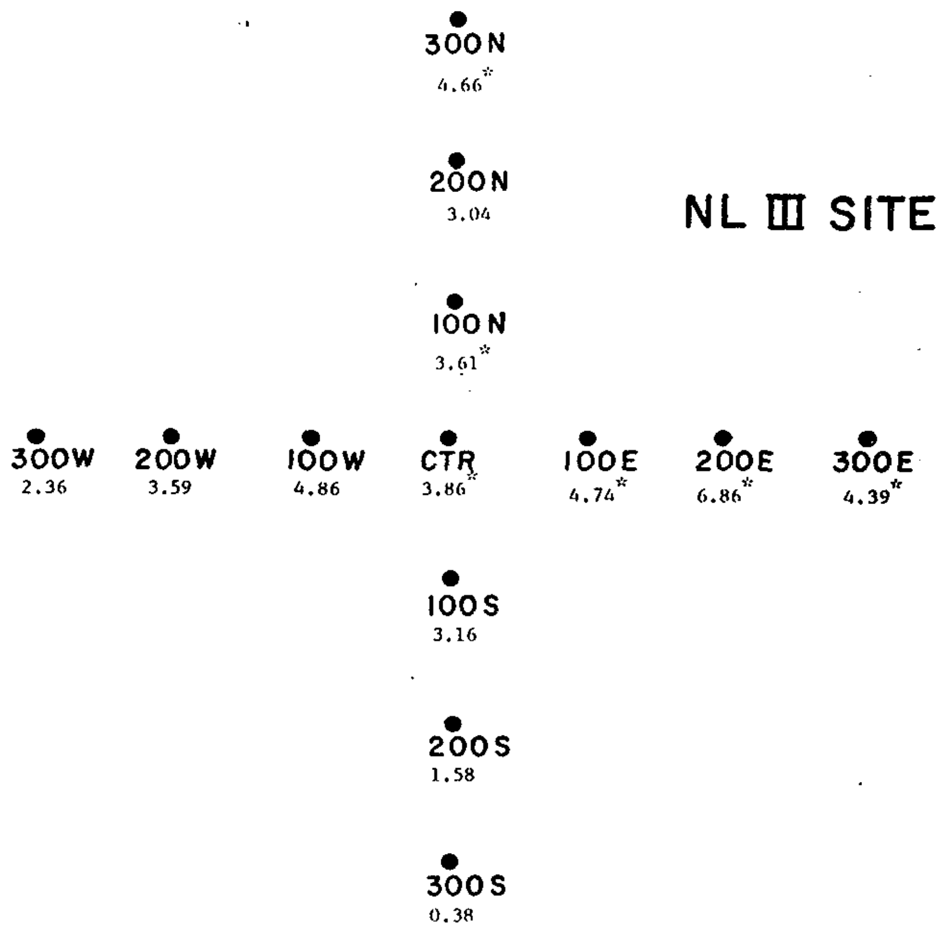

Figure II-4-10. Mapped ditribution of mean RPD depths for stations in the NL site.

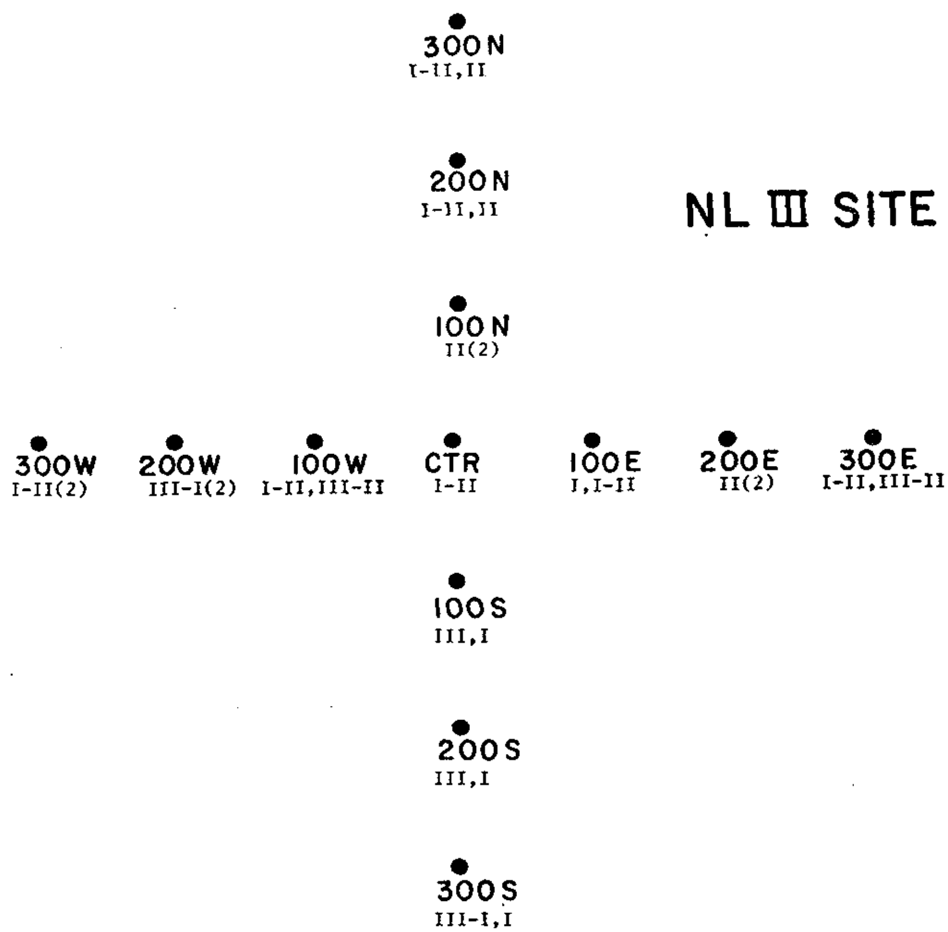

Figure II-4-11. Mapped distribution of successional stages for replicates in the NL III site.

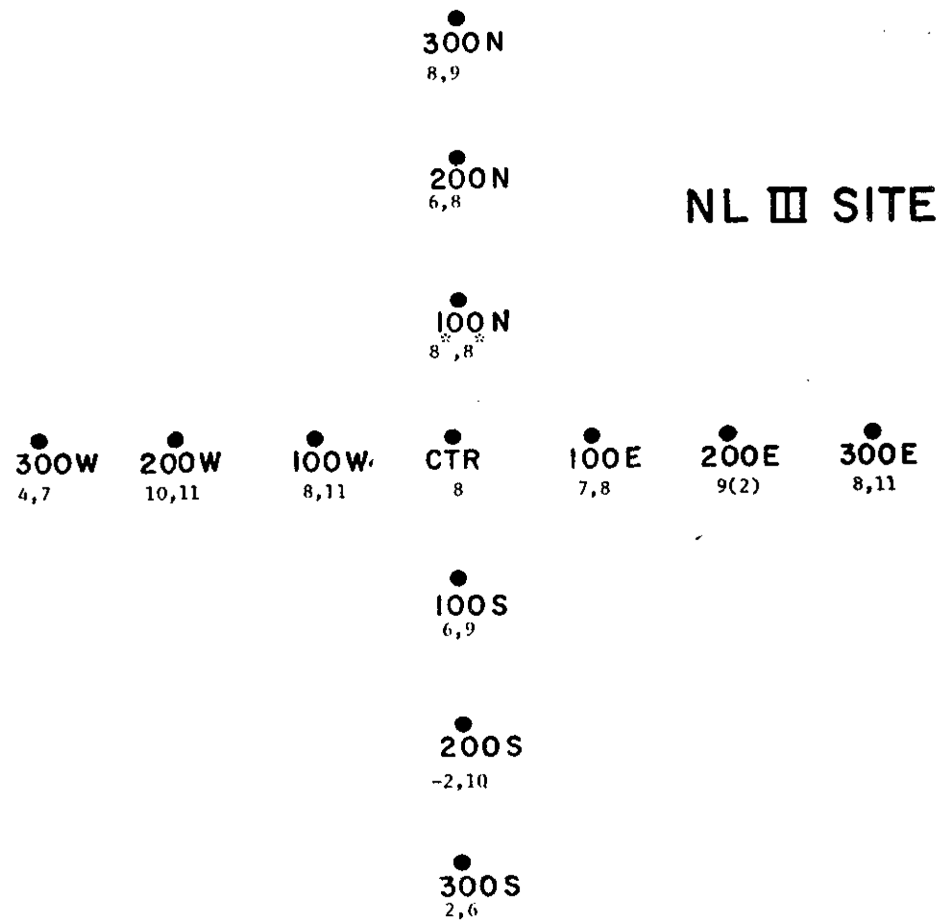

Figure II-4-12. Mapped distribution of benthic indices at NL III site.

for identifying dredged material) is not present in either replicate from station 300W, one replicate does show a layer of coarse-grained sediment (fine sand) on top of fine-grained sediment (silt), indicating a recently-deposited sedimentary interval. Stations 300W, 200W and 300S may have received dredged material during the DGC site disposal operations, resulting in significantly lower benthic indices at these stations.

4.1.3 DGC Site

Most replicates in the DGC site show grain-size major modes in the silt to very fine sand classes (>4-3ϕ) with ranges extending into the fine sand (2ϕ) and medium sand (1ϕ) classes. Surface layers of coarse-grained sediment (fine to medium sand) on top of fine-grained sediment (silt), similar to those found in replicates from the NL III site, are present at stations 100N, 200W, 100E, 200E, and 100S (Fig. II-4-2). As mentioned above in the NL III site section, these coarse-grained surface layers may represent dredged material sedimentary intervals.

In all replicates from stations 200E and 100W, layers of low reflectance, reduced sediment near the surface suggest the presence of recently deposited dredged material (Fig. II-4-13). One replicate at station 200W shows what appears to be an extensively recolonized and biologically aerated dredged material layer, the depth of which is greater than the prism penetration depth. Patches of material at depth are present in station 100N, 200W, CTR, 100E and 100S. Deposition at these stations does not appear to have been as recent as at stations 100W and 200E, as dredged material in all of these stations is overlain by relatively thick layers of aerated sediment. In addition to surface layers at stations 100W and 200E, relict dredged material appears to be present at depth (Fig. II-4-13). If dredged material was deposited simultaneously at these two stations and other stations showing dredged material at this site, then it appears that stations 100W and 200E have received additional, more recent inputs of dredged material. The proximity of station 200E on this grid to stations 200S and 300S on the NL III grid (see Fig. II-1-2), both of which also show evidence of recent dredged material deposition, suggest that the eastern portion of the DGC site, the southern portion of the NL III site, and the area between form a continuous recent disposal area. The presence of dredged material at 100W suggests that recent material distribution may be patchy in the DGC site. Such a conclusion is supported by the contour chart developed from the post DGC disposal operation shown in Figure II-2-7. This chart indicates that the development of a mound occurred to the east of the DGC buoy.

Figure II-4-14 shows the mapped distribution of mean RPD depths for all stations at this site. Figure II-4-5 shows the frequency distribution of RPD depths for all replicates from the DGC site. There is a broad range of RPD depths (from 0.14 cm to 7.35 cm) at this site. However, more replicates are in the lower classes for RPD depth than in the NL or the NL III sites, with the major mode for this site in the 0.0 to 2.0 cm class

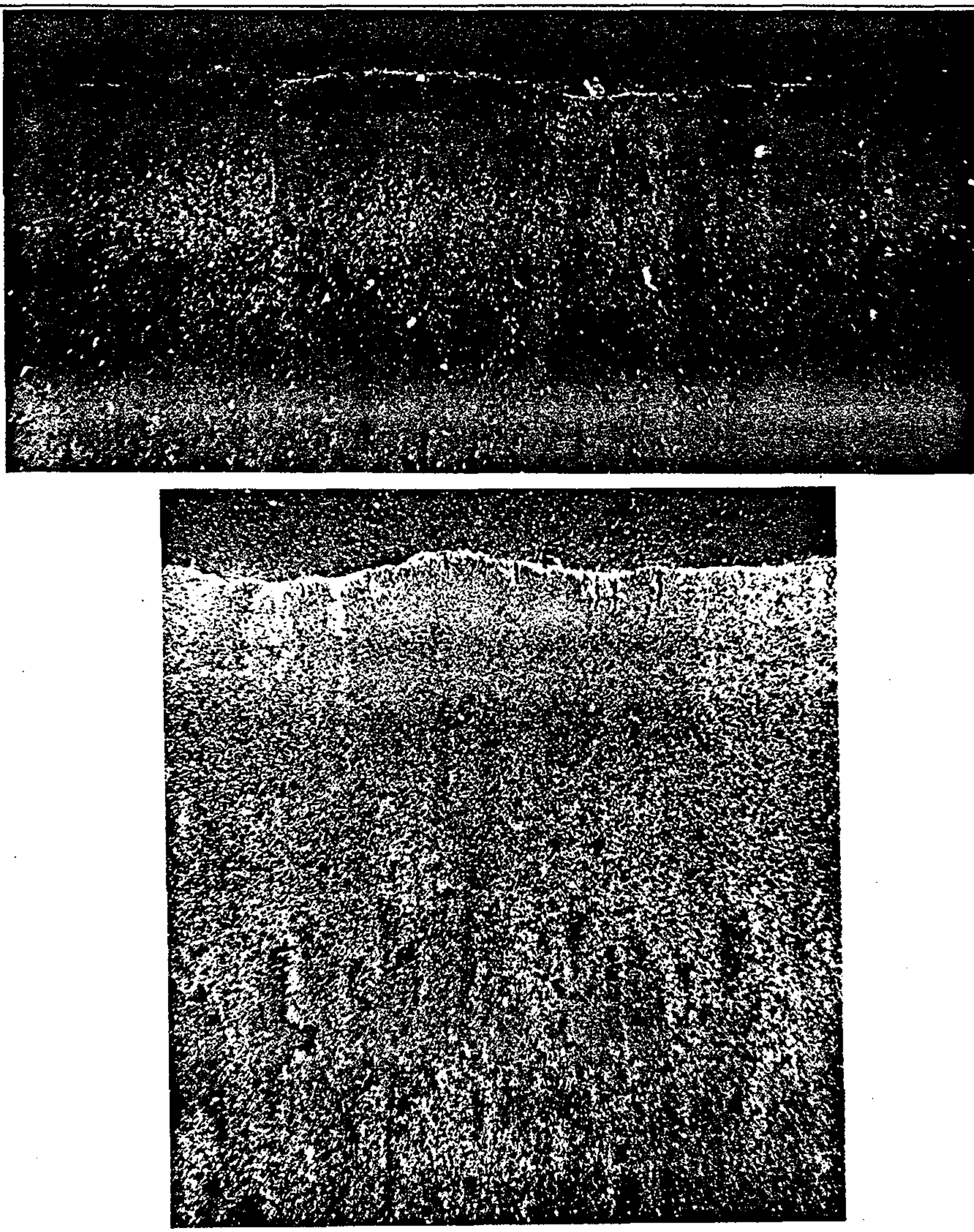

Figure II-4-13. REMOTS images from a) station 200E and b) station 100W in the DGC site, showing what appear to be surface layers of recently deposited dredged material.

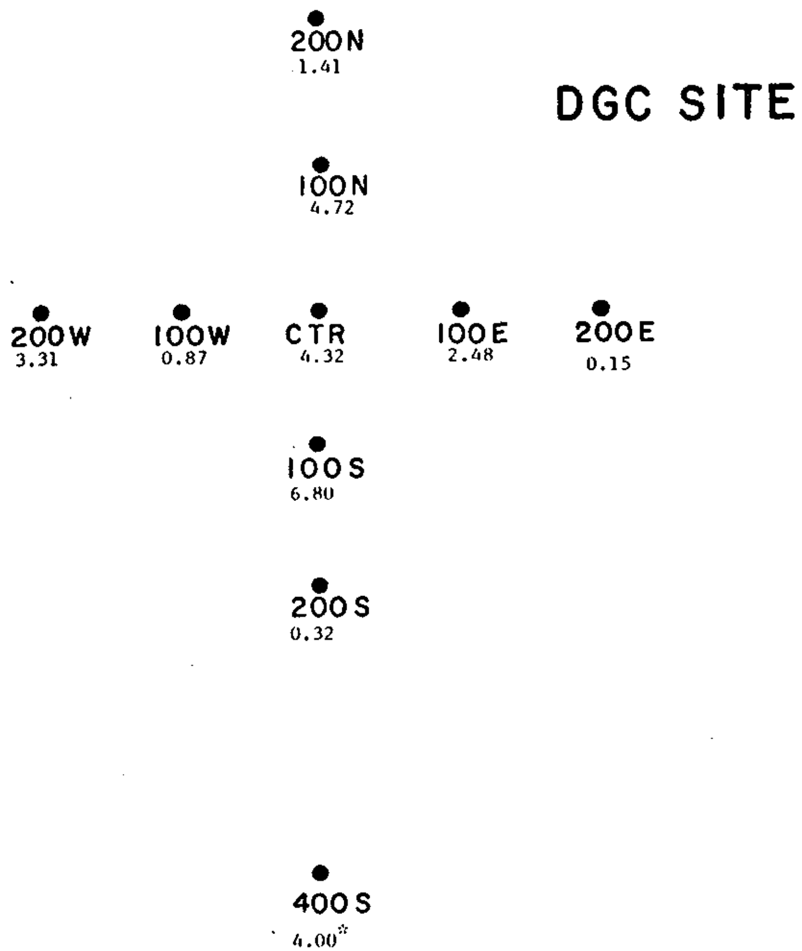

Figure II-4-14. Mapped distribution of mean RPD depths for stations in the DGC site.

(n=8). Shallow RPD depths at this site can be attributed to the apparent presence of recent dredged material at stations 100W and 200E, and RPD "rebounds" towards the surface at stations 200W, CTR, and 200S. The spatial distribution of RPD depths does not show any clear trends, except that, as mentioned above, shallow RPD's at station 200E seem to be related to the presence of dredged material and shallow RPD's in the southern axis of the NL III site. Shallow RPD's elsewhere in this site may be related to the patchy distribution of dredged material.

Figure II-4-15 shows the mapped distribution of successional stages for all replicates at the DGC site. The genus Ampelisca is absent from this site; therefore, no replicates are classified as Stage II. A mixture of Stage I, Stage III and Stage III-I successional seres are present, with a majority (71%) of replicates in Stage I. Stage III-I assemblages are present in both stations from the northern axis of the DGC grid, station 100E, and station 100S.

Benthic indices for all replicates in the DGC site are mapped in Figure II-4-16. Figure II-4-8 shows the frequency distribution of benthic indices for this site. Benthic indices are lower on the average at this site than at the NL or NL III sites. There are as many replicates in the DGC site in the 0-5 range for benthic index (n=8) as there are in the 6-11 range. The major modes are at 2 and 7.1. Low values for benthic index primarily refelct the shallow RPD's found at some stations resulting from recent dredged material deposition and/or RPD rebound. Benthic indices tend to be lower along the east-west transect (x=4) than along the north-south transect (x=7), perhaps reflecting the distribution of dredged material which appears to be more prevalent along the east-west transect. Benthic indices are particularly depressed (B.I. = 2(3); 3(1)) at stations 100W and 200E, where recent dredged material intervals are apparent.

4.1.4 NLON Site

The major mode for grain-size in replicates from stations 400N, 200N, 200W, and 200S is in the silt-clay class ($>4\phi$), finer than the dominant grain-size in the other sites and in other stations from this site (>4-3ϕ). Ranges for stations in this site extend into the 2ϕ (fine sand) and 1ϕ (medium sand) classes. One replicate from station 200E has a major mode in the fine sand class (3-2ϕ). There are no instances of surface sand layers overlaying silt-clay in this site as there are in the NL, NL III, and DGC sites.

Low-reflectance, reduced sediment which may be recently dredged material is apparent in only one station, 400N, from the NLON site. The dredged material layer is deeper than the prism penetration depth (2.31 cm) in the one replicate in which it appears.

In all of the replicates from the NLON site, the RPD depth is greater than the prism penetration depth, so that only

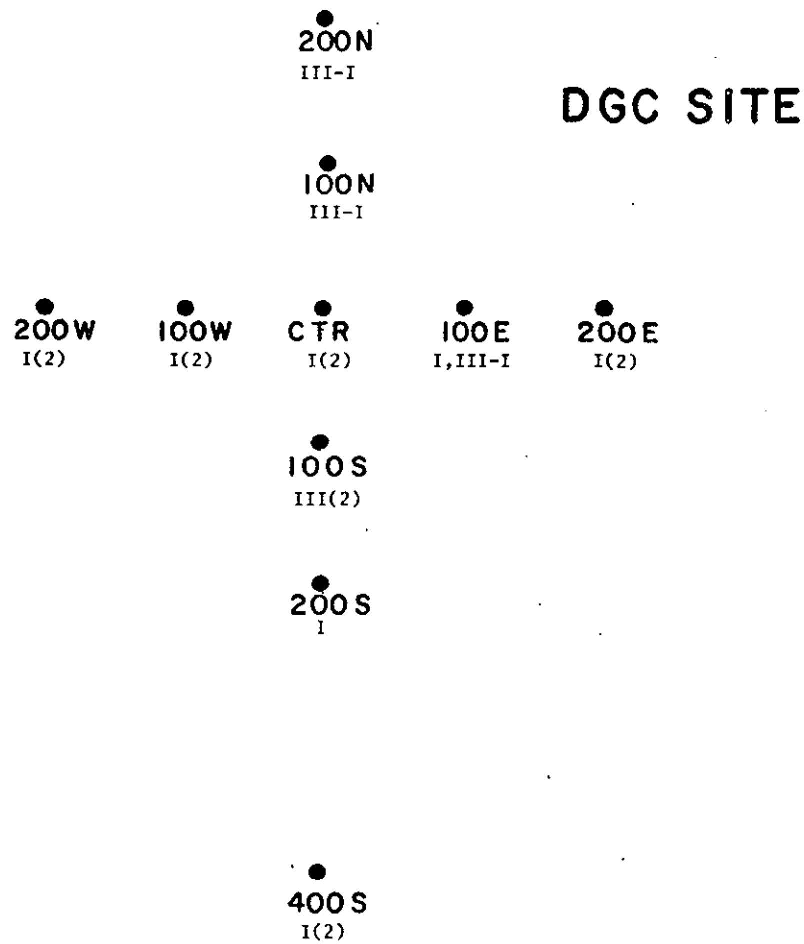

Figure II-4-15. Mapped distribution of successional stages for replicates in the DGC site.

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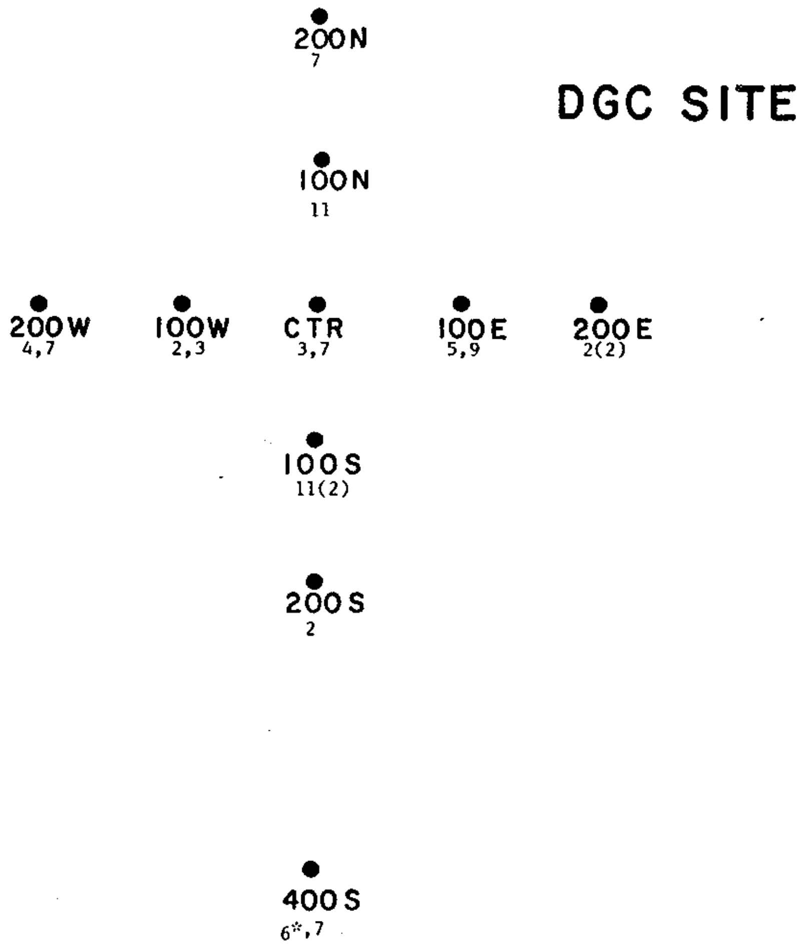


Figure II-4-16. Mapped distribution of benthic indices for replicates in the DGC site.

minimum RPD depths can be established (Fig. II-4-17). Nonetheless, it is clear that this site is more uniform with regard to RPD depth than the NL III site or the DGC site, and that extremely thin biologically-aerated surface layers are not present. The relative homogeneity of this site with regard to RPD may be attributable to the absence of recently-deposited dredged material, and the recolonization of previous deposits by mature Stage III organisms.

The mapped distribution of successional stages for all replicates is represented in Figure II-4-18. Fifty-eight percent of all replicates are in Stage I, although some of these may have shown evidence of Stage III assemblages if the optical prism had penetrated to a greater depth. The remainder of replicates are in Stage III or Stage III-I, with the exception of one replicate from station 200E in which Ampelisca are visible. This replicate is transitional between Stage I and Stage II.

Benthic index could only be determined with certainty according to the criterion described in the "NL site" section. For most replicates, a minimum and maximum benthic index could be established, and the mapped distribution of these values is shown in Figure II-4-19. The lowest possible benthic index for this site is 4, which is substantially higher than the lowest benthic index for the NL III site (-2) and that for the DGC site (2). This results from the fact that this site has not received dredged material recently and, therefore, organism-sediment relationships have developed free of disturbance as compared with the NL III and DGC sites, where recent disposal has occurred.

4.1.5 SE REF Site and NL REF Station

Grain size major mode for most replicates in the SE REF site and the NLREF station is >4-3ϕ (silt to very fine sand). Ranges extend into the 2ϕ class (fine sand). There is no dredged material visible in any replicate from the SE REF site or the NLREF station.

Penetration of the optical prism was minimal or did not occur at all in replicates in the SE REF site and the NLREF station. In all cases, the RPD depth was greater than prism penetration and, because prism penetration was poor, an RPD measurement is indeterminant. However, a biologically-aerated layer of sediments does appear to exist in all replicates. No replicate appears to be anoxic or azoic.

Replicates from the SE REF site generally show evidence of Stage I successional seres. It is impossible to determine, however, whether or not higher-order successional seres are present below the penetration depth of the prism. Stage I successional seres are not apparent in replicates from the NLREF station. Organisms characteristic of Stage III successional sere may be present at greater depths. No replicate from either the SE REF site or the NLREF station appears to be azoic. Hydroids are present in every replicate from the SE REF site, and are not present in any replicate from the NLREF station.

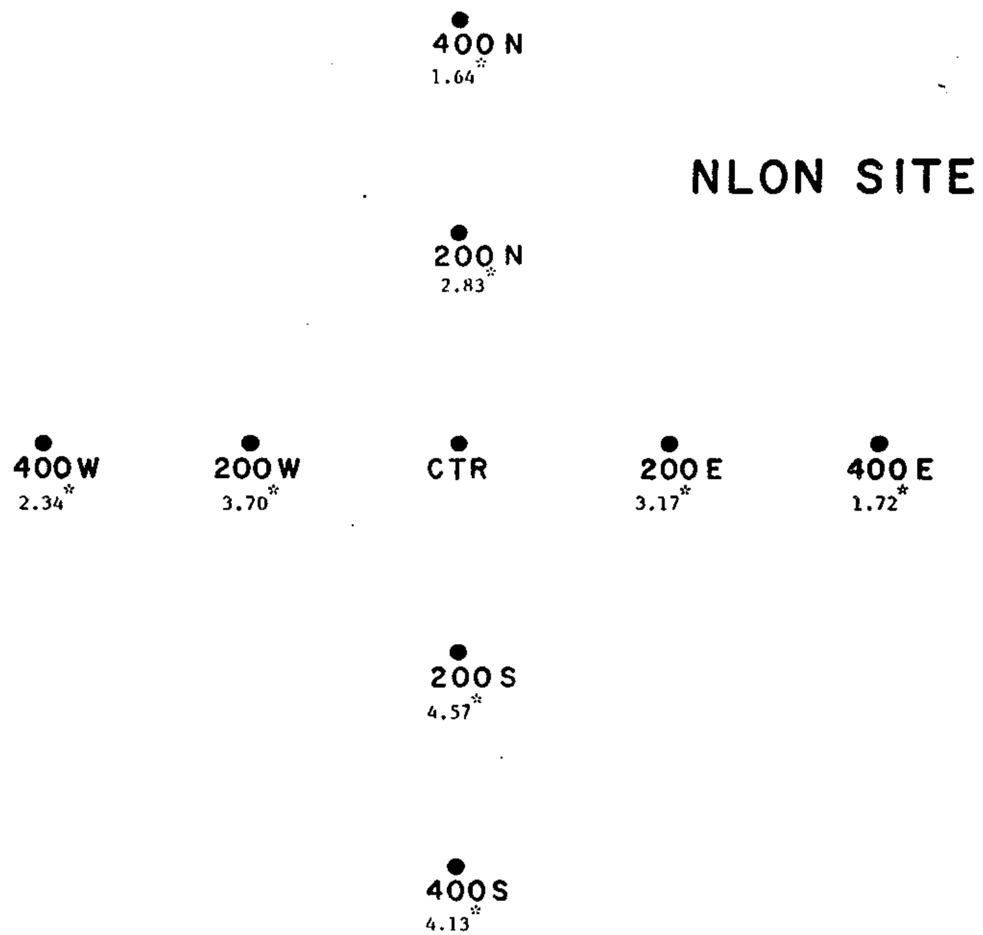


Figure II-4-17. Mapped distribution of mean RPD depths for stations in the NLON site.

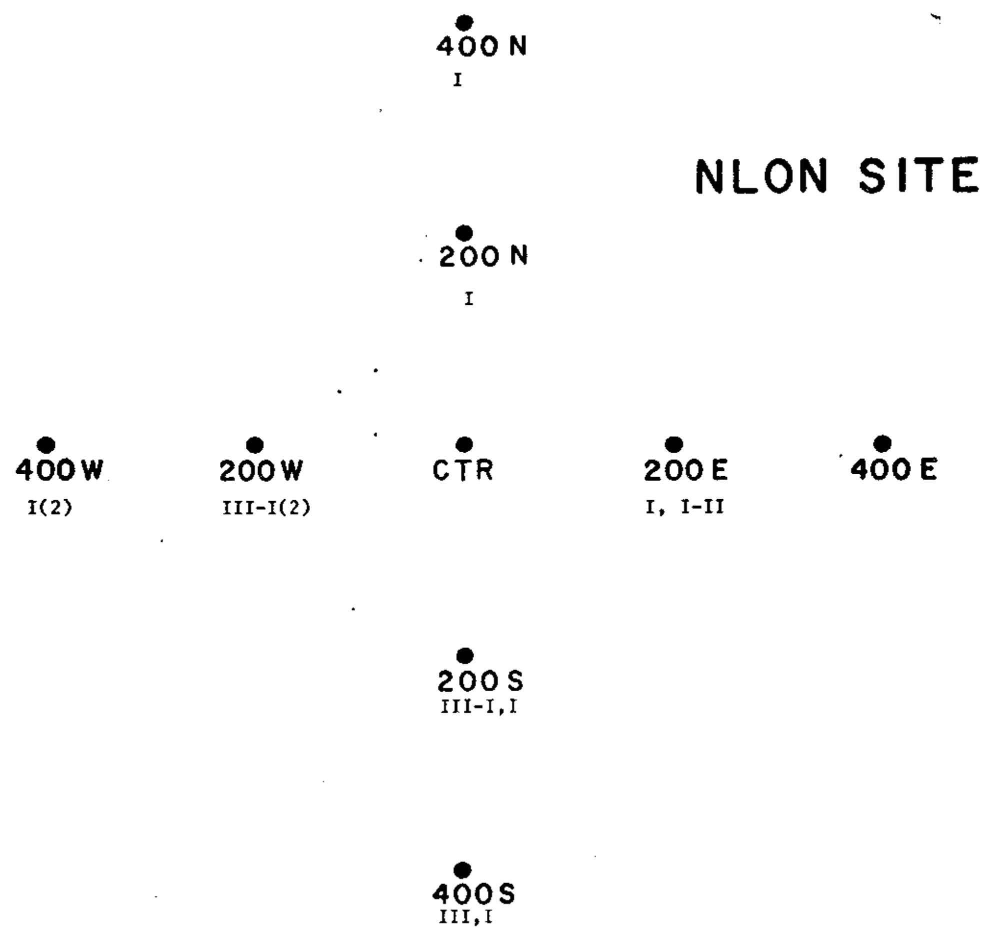


Figure II-4-18. Mapped distribution of successional stages for replicates in the NLON site.

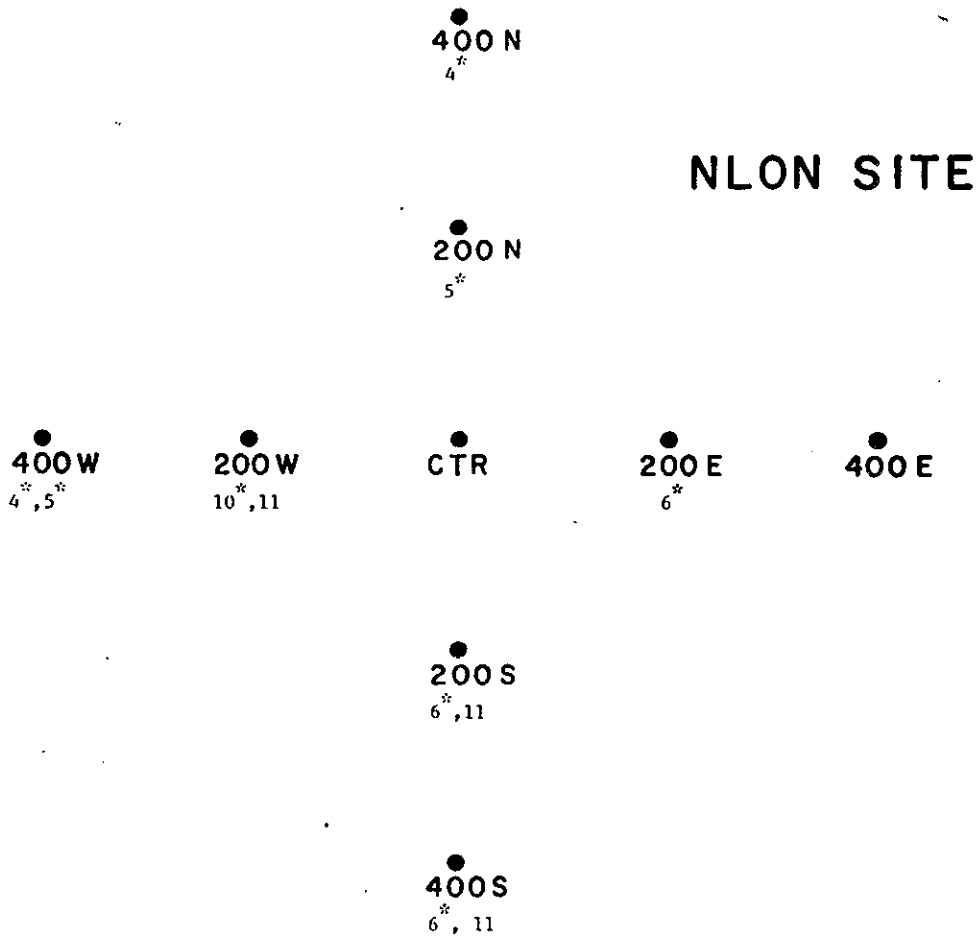


Figure II-4-19. Mapped distribution of benthic indices for replicates in the NLON site.

Because of the uncertainty of both RPD depth and successional stage for all replicates in the SE REF site and the NLREF station, benthic indices were not determined.

4.2 Conclusions

Major mode for grain-size throughout the survey area is generally in the >4-3 ϕ class (silt to very fine sand).

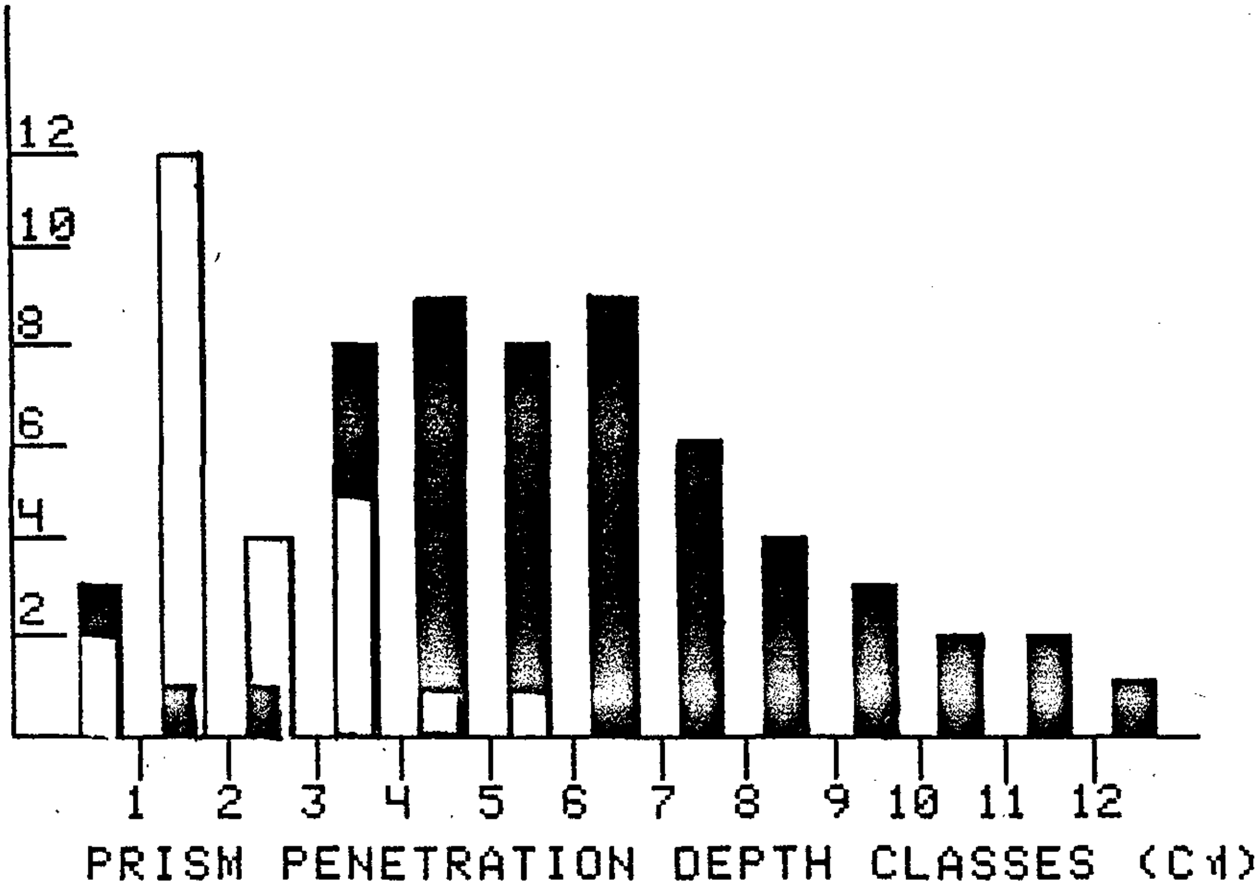
Dredged material is present in the NL, NL III and DGC sites in the form of surface layers of relatively coarse-grained sediment (3-1 ϕ) and/or layers or patches of low-reflectance, reduced sediment. Recently deposited dredged material may be present in one replicate from the NLON site.

Prism penetration depths for the three sites in which dredged material is visible are greater on the average than for the sites (NLON, SE REF and NLREF station) where recent dredged material does not apear to be present (Fig. II-4-20). A correlation was found in previous surveys between the presence of dredged material and deeper-than-average prism penetration. The evidence from this survey supports this correlation.

Recent deposition of dredged material has occurred in stations 200S and 300S in the NL III grid and 200E and 100W in the DGC grid. Thin biologically-aerated surface layers exist at these stations. The proximity of these stations to each other suggests that stations 200S and 300S in the NL III site and station 200E in the DGC site may have been near the center of a recent disposal event, and that station 100W in the DGC grid may indicate patchiness of dredged material outside this center.

The NL, NL III and DGC sites show wide distributions with respect to RPD depth and benthic index. For instance, in the DGC site, four replicates have a benthic index of 2, four have a benthic index of 7, and three have a benthic index of 11. Wide distributions in these parameters in the NL III and DGC sites result from the variable distribution of dredged material. Where recently deposited material is present, RPD's are thin and benthic indices are low. In the NLON site, RPD's are uniformly deeper, and benthic indices are consistently higher.

In the NL, DGC, and NLON sites, Stage I and Stage III successional seres predominate. In these three sites, Stage I organisms are almost ubiquitous, while evidence of Stage III organisms is visible in approximatley 30% of replicates. In replicates where prism penetration is poor, evidence of a Stage III successional sere may have been present at greater depth. _Ampelisca_ are present in most replicates from th NL III site, leading to a patchwork of I-II, II, and III-II successional seres. _Ampelisca_ are not present in the three southern stations from this site, where recent dredged material layers are visible. It is possible that the absence of _Ampelisca_ in these three stations is related to the introduction of dredged material.



-Station replicates from sites at which dm is present (NL,NL III,DGC)

-Station replicates from sites at which dm is not present (NLON, SE REF, NLREF station)

Figure II-4-20. Histogram comparing prism penetration depths in sites where dredged material was visible in more than one station (NL,NL III, and DGC sites) versus sites where dredged material was visible in one or no stations (NLON and SE REF sites, NE REF station).

RPD depths, successional stages, and habitat indices from the SE REF site and the NLREF station are indeterminate because of inadequate prism penetration. The only conclusions that can be drawn are that a biologically aerated layer exists in all replicates, and that surface layers of dredged material are not visible in any replicate from the SE REF site and the NLREF station.

5.0 SUMMARY

Several important conclusions relative to management of disposal operations in New England can be drawn from the results of studies at the New London Disposal Site. Most important of these are related to the stability and recolonization of the major disposal mound created by the 1977-79 dredging operation. Results of bathymetric surveys indicate very little change in this mound over the past four years, sediment samples show that contaminant levels are comparable with background, and recolonization of the site has taken place to the extent that RPD depths and benthic indices are typical of a normal healthy bottom in this area. This site has provided a basis for much of the management policy utilized by the New England Division to address relatively uncontaminated dredged material and is ample proof that successful disposal in relatively shallow water can be accomplished.

III. RHODE ISLAND AND SOUTHEASTERN MASSACHUSETTS DREDGING NEEDS SURVEY

1985 - 1995

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1.0 INTRODUCTION

Considerable concern has been expressed during the last several years by operators of water dependent businesses (ports and marinas) and environmentalists over the safe disposal of dredged material along coastal Rhode Island and Southeastern Massachusetts. Two previous reports, the RI Dredging Needs Survey (1980-1985) and the New England River Basins Commission Long Range Dredging Study (1981-1990) have suggested that there was a need for dredging operations in the southeastern New England region. The concern over the apparent need for dredging and the safe disposal of dredged materials was heightened by recent congressional interest and has raised the issue of the designation of a regional disposal site, either on land, in open water, or both.

To further define the need for a regional disposal site, it was deemed necessary to reassess the dredging needs on a regional basis. The objectives of this survey are the identification, classification, and projection of anticipated dredging needs for a ten year period from 1985-1995. This is part of a joint effort by EPA Region I and the New England Division of the Army Corps of Engineers. The results of this study will be incorporated into an EIS currently under development by EPA to facilitate the formal designation of a regional disposal site(s). The geographical study limits (Fig. III-1-1) for this study are:

Western Limit	-	Rhode Island/Connecticut State Line
Eastern Limit	-	From RI/MA border east to outer Cape Cod area to Pleasant Bay (inclusive)
Islands	-	Martha's Vineyard, Nantucket Island and Block Island
Other	-	Cape Cod Canal from Buzzard's Bay to Sagamore Bridge

The study builds upon and extends the information and the area of the original study which the University of Rhode Island's Marine Advisory Service (URI, 1981) completed several years ago. This study has the following objectives:

1. Identification and projection of the magnitude of 1985-95 dredging needs in Rhode Island and Southeastern Massachusetts coastal areas.

2. Identification of locations where this need is most pressing.

3. Identification of past (1981) perceived need for dredging and work actually accomplished between 1981 and the present in Rhode Island.

4. Identification of user group perceptions of

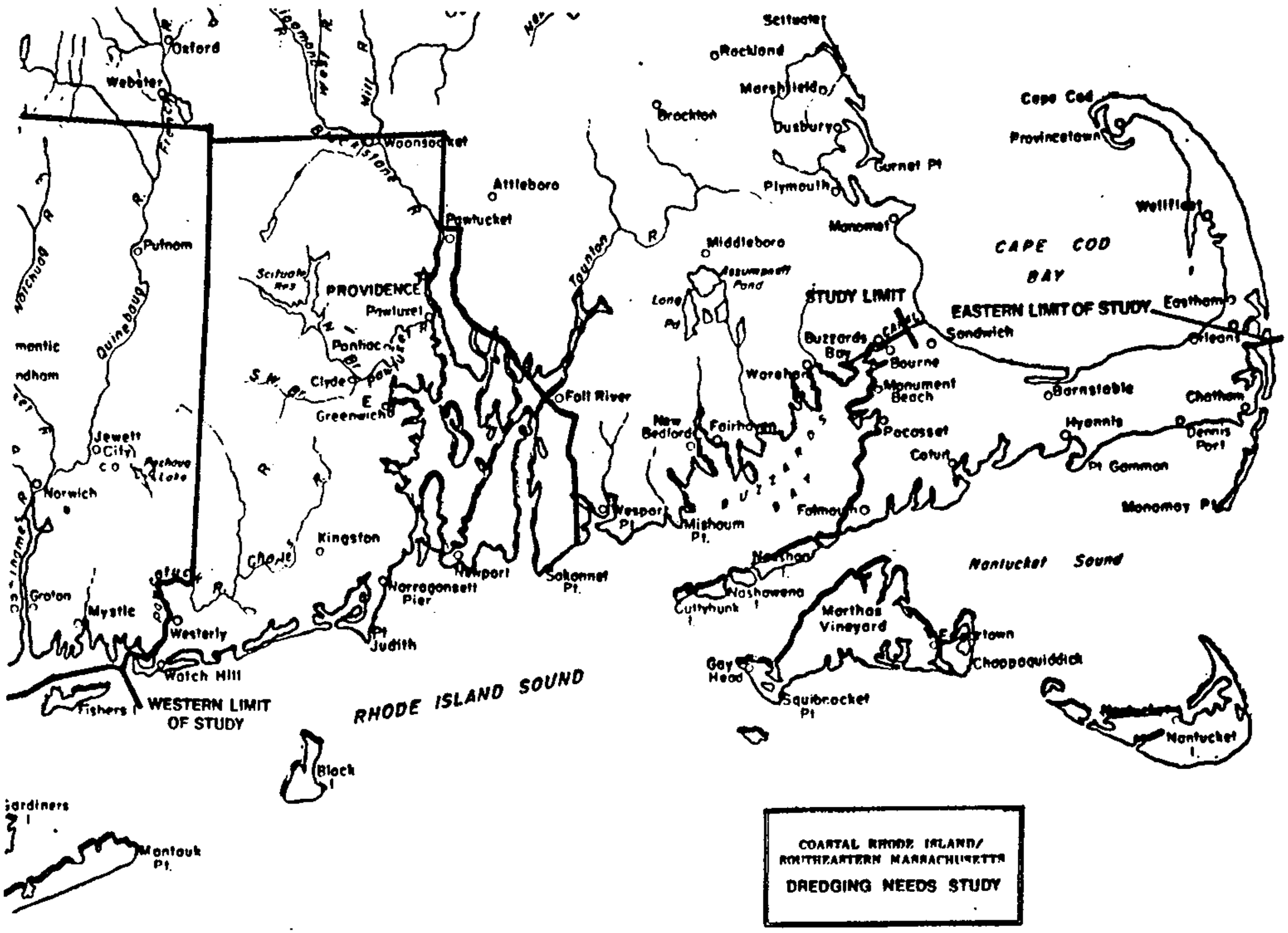

FIGURE III-1-1. Dredging Needs Study Area.

TABLE III-2-1

RI-MA Dredging Needs Survey, 1984

1. Do you plan to dredge your facility within the next ten years?
   Yes No
2. If not, why not?
   No physical need
   Cost too high
   Regulatory system too involved
   Other
3. If you do plan to dredge, is this to be considered
   Expansion of existing facilities
   Maintenance
4. If you do plan to dredge, which part of your operation will this benefit or improve?
   Berths or slips
   Channels
   Mooring basins
   Ramps/Marine RR/Piers
5. How has your operation been affected by your need to dredge?
   Berths or Slips
   Moorings
   Channels
   Ramps
6. If you do not dredge within the next ten years, how will this affect your operation?
   Berths or slips
   Moorings
   Channels
   Ramps/Marine RR/Piers
7. How much material must be removed?
8. How will it be disposed of?
   On land
   In water near operation
   In water away from operation, please cite the specific waterbody if known.
9. How would you prefer to dispose of this material?
10. Have any tests been made to determine the composition or quality of the sediments?
11. Please explain what was found.
12. Based on your own observation, how frequently do you expect to dredge in order to maintain your current operation?
13. On what basis did you determine this need?
14. Which of the following best characterizes your operation?
    Port, ships and terminal facility
    Recreational Club
    Commercial Marina or Boatyard
    Commercial Fishing Port
    State Facility
    Municipal Facility
    Private
15. What is the limiting distance beyond which open water disposal would be clearly impractical for your project?

quality of dredged material and preferred means of disposal.

5. Identification of perceptions of users related to
   (a) regulatory process,
   (b) impact on existing and future operations,
   (c) preferred means of disposal.

2.0 METHODS

The procedures used in this effort closely followed those which were used in a similar study undertaken in 1980. The previous project was undertaken by the Marine Advisory Service at URI (URI, 1981) and estimated the dredging needs between 1980 and 1985. The information necessary to cover the 1985-95 period was basically obtained in two ways. First, permit records at the New England Division of the Army Corps of Engineers for the period 1978-1984 were reviewed. From these records, a list was compiled of those persons, organizations, towns, etc. that had received dredging permits and hence would be likely to dredge in the future. Secondly, reference publications such as the Boating Almanac, Waterways Guide and Coastal Zone Management (CZM) Atlas were used to generate a comprehensive listing of boatyards, marinas, yacht clubs, and municipal coastal facilities. From these two lists, a master list was developed for mailing purposes.

A preliminary questionnaire (Table III-2-1), consisting of fifteen questions, was drawn up. Since no formal survey pretesting was possible, in part because a complete census was intended, a few additional questions were added to the RI Survey subsequent to finalization of the survey instrument. These questions were added because URI has had previous research experience with the user community of the state. Although the additional questions were not directed by the Corps of Engineers as part of this study, it was felt that the additional information would enhance the cooperative nature of the relationship between URI and the user groups, without biasing the survey.

Since the summer is the busiest time for marina operators, boatyards, and sail clubs, the list of questions was mailed out prior to the actual interviews. The intent was to minimize the time required to complete the interviews, most of which were conducted by telephone. Approximately one week after the questionnaires were mailed out, the interviews began. To minimize bias, all interviews were done by one person, although when specific questions arose, the principal investigator recontacted the respondent. In a few cases, the interviews were conducted face to face, necessitating some travel. When multiple State or Federal projects, (either ongoing or projected) were involved, the interviews were conducted in person. Only one private respondent requested a personal interview, and since several proposed projects were involved, we felt it more efficient to obtain this information in person.

A total of 295 facilities were identified in Rhode Island (Appendix: Table 1) and 212 in Massachusetts (Appendix: Table 2). In the RI survey, only 10 firms, usually consisting of small marinas and boatyards, refused to participate or could not be contacted. This represents a remarkably high success rate, approaching 97%. In Massachusetts, of the 212 facilities identified, 163 or 77% responded to the survey. While no specific question was included to ascertain the reason for the relatively high response in RI, we believe that industry awareness related to the issues of dredging and coastal zone management, and the great importance which the state government has placed on both tourism and boating, has created an environment of cooperation between the private and public sectors.

At the termination of the interviewing process, all information was coded and processed at the University of Rhode Island, where the Statistical Analysis System (SAS) was used for the subsequent analysis. This program is especially useful when the data consists of both parametric and nonparametric data. Plotting and graphing was accomplished using CALCOMP plotting routines. Printouts of the raw data appear in Appendix: Tables 3 and 4.

Immediately following this section is an overview summarizing the data and information for both states. Past dredging activities within the state (covering the period 1981-1985) are addressed, followed by an assessment of the perceived needs during the next ten years (1985-1995).

The next section disaggregates the information by region and is accompanied by a series of maps which seek to identify both past and future (anticipated) dredging needs by the respondents.

In reading the report, it should be kept in mind that the information provided by the respondents was based on recollection, rough estimates, and obtained generally without the benefit of detailed engineering and benefit/cost estimates.

3.0 DREDGING NEEDS

3.1 Past Dredging Activities, 1981-1985

The types of facilities which responded to the survey are shown in Table III-3-1. In the ensuing analysis, commercial marinas and boatyards consist of private for profit corporations servicing boating needs both on land and in the water. Municipal facilities include piers and ramps and such other facilities operated by the coastal community, servicing predominantly recreational boating, although commercial fishing may also be serviced by these facilities. The distinction between these and fishing ports is one of degree. A fishing port (Galilee and, to

TABLE III-3-1

Facilities

Respondents	RI #	RI % of Total	MASS #	MASS % of Total
1. Commercial Marinas and Boatyards	99	35.2	77	48.0
2. Municipal Facilities	45	16.0	20	12.6
3. Private Facilities	33	11.7	32	20.1
4. State Facilities	29	10.3	1	0.6
5. Port Authorities/Shipping and Terminal Facilities	27	9.6	3	1.9
6. Yacht, Fishing and Other Recreational Clubs	25	8.9	10	6.3
7. Federal Projects	19	6.9	12	7.5
8. Other	8	2.7	8	4.9
Total Number of Respondents	285		163	

a lesser extent, Newport) is a specialized function created and primarily operated to service the state's fishing industry.

Private facilities include non-profit privately owned structures which could serve more than one user, but which have not formally been incorporated. State facilities consist primarily of ramps, slips and mooring areas which are operated principally to service the recreational boating demand. Port authorities, shipping and terminal facilities include both commercial facilities, and projects intended to service the commercial shipping industry.

Yacht, fishing and other recreational clubs include organizations created to service the needs of privately organized groups seeking recreational access to the water.

Federal projects are those which, while initiated by the general public, are deemed to have wider social value in which the benefits are accruing to the general public and not to an individual, organization or corporation. These projects include the dredging of channel and anchorage areas that are Congressionally approved civil works projects and which are then implemented by the U.S. Army Corps of Engineers.

Most of the respondents with identified needs consisted of commercial marinas and boatyards (RI - 34.7%; MA - 47.2%), yacht clubs and other water based recreational organizations, reflecting the heavy emphasis which both states have placed on developing their coastal oriented tourism and boating activities (Table III-3-1). This is especially evident in Massachusetts, where the large number of private facilities (19.6%) reflects the growing tourist industry of Cape Cod. These facilities cater to large pleasure craft and the recreational boating needs. The next largest category consisted of projects which tend to favor the fishing industry. Most municipal facilities (15.8% in RI and 12.3% in MA) are geared toward providing the fast growing fishing industry with sufficient berth space. In Rhode Island, this demand has manifested itself in two ways. First, the fishing fleet has increased numerically. One estimate suggests that since the passage of the Fishery Conservation and Management Act, which extended the previously protected fishing zone to 200 miles, the fleet has grown by approximately one third (R. Boragine, Executive Director, R.I. Seafood Council, personal communication, Sept. 1984). Second, a very distinct evolution is taking place where the tendency has been to move from relatively small inshore day boats to offshore trawlers and other multi-purpose vessels which are better capable of utilizing the fish stocks located offshore.

Both developments appear to have put severe strains on many shore facilities which traditionally have serviced the fishing fleet. Greater numbers of fishing vessels require more berth space, while larger vessels often require deeper channels; these may not be available in rapidly silting locations or those facilities which are able to service only the smaller inshore vessels.

Another major group identified particularly in Rhode Island was commercial shipping, which makes up slightly less than 10% of the total. While this industry has undergone some changes during the past few years, these have not been as dramatic, and may have reduced the relative demand for dredging projects within the study area. Providence's most important cargo used to consist of oil products. With decreasing demand, followed by a greater dependence on truck transport, a significant amount of oil related import/export cargoes to Providence now come by way of shallow draft tanker barges. Considerable efforts have been made to expand upon the Port of Providence general cargo capacity especially by attracting container shipping and automobile cargoes. At best, these efforts have been only marginally successful, and appear not to have been adversely affected by the need for deeper channels, berths and turning basins.

Another dimension of potential impact to operators relates to the specific facilities which would be affected in the absence of dredging. A total of 165 projects in Rhode Island were cited as having been adversely impacted by not being dredged during the period 1981-1984, while in Massachusetts approximately half that number (84) cited adverse impacts (Table III-3-2).

Table III-3-2 reinforces the tentative conclusions drawn from information contained in Table III-3-1. Recreational boating in its many forms seems to be more impacted by the absence of dredging than either commercial fishing or shipping. Several factors may account for this. First, most berths and slips are located in relatively sheltered bays, inlets, ponds and rivers, where natural sedimentation rates would be expected to be higher. Since wave action and currents are weaker in these areas, seaward accretion and filling proceed at a faster rate compared to less protected waterbodies where active erosion is most often the case. Another consideration which may be even more important relates to previously dredged areas which may become sinks. Sedimentation sinks are areas in which sediments will tend to be deposited. Since the ocean bottom can be viewed as a surface in steady state affected by such factors as wave action, currents, and sediment load, dredging activities are often only temporary solutions. Most dredged areas will tend to revert back to this original state, given that the forces creating them in the first place have not been altered. While there are exceptions, both in the rate of filling and the overall need for dredging, most projects can expect to require maintenance dredging in the future.

One question was included in the surveys seeking to determine the amount of material (in cubic yards) the respondents dredged during the 1981-1984 period. While only a small amount of dredging has occurred in Massachusetts during this period (approximately 20,000 cubic yards), a modest amount of dredging has taken place in Rhode Island, totalling 314,737 cubic yards (Table III-3-3). There are probably several reasons for this. There is a history of public concern about the potential adverse impacts caused by dredging. To a considerable extent, this

Table III-3-2

Functional Impacts to Facilities Because of No Past Dredging

1981-1984

# of Respondents Citing Impacts On:	RI #	RI % of Total	MASS #	MASS % of Total
Berths & Slips	53	18.6	32	19.6
Mooring Area	1	0.3	3	1.8
Channels	29	10.2	19	11.6
Haul-Out Facilities	27	9.5	7	4.3
Berths, Slips & Channels	30	10.5	5	3.1
Berths, Slips & Haul-Out	10	3.5	0	0
Mooring Areas & Channels	3	1.0	3	1.8
Channels & Haul-Out Facilities	4	1.4	3	1.8
Berths, Slips, Mooring Areas & Channels	2	0.7	3	1.8
Berths, Slips, Channels & Haul-Out Facilities	5	1.7	3	1.8
Berths, Slips, Mooring Areas, Channels & Haul-Out Facilities	1	0.3	6	3.7
SUBTOTAL	165	57.7	84	51.3
Facilities Not in Need of Dredging During 1981-1984	120	42.1	10	6.1
No Response	0	0	69	42.3
Total Number of Respondents	285		163	

Table III-3-3. Volume of Past Dredging Operations by Facility (yd^3) during 1981-1984.

	RI	MASS
Port Authorities & Shipping Terminals	59,500	0
Recreational Clubs	3,700	0
Commercial Marinas	137,160	0
State Facilities	25,227	0
Municipal Facilities	0	7,713
Private Facilities	1,150	0
Federal Projects	88,000	11,690
TOTAL	314,737	19,403

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concern was in response to several pieces of environmental legislation which addressed coastal environmental projects, including the National Environmental Policy Act (NEPA), Coastal Zone Management Act (CZMA), Clean Water Act (CWA), and the Rivers and Harbors Act (RHA), as amended. There is no doubt that the regulatory system which was initially created may have discouraged several respondents from proceeding with projects.

Again, the dredging volumes of the commercial marinas and boatyards exceed those of any of the other identified groups, followed by federal and commercial ports and terminals. The dredging of the remaining groups were minimal, with the exception of state facilities, and absent for both the fishing ports and the municipalities. The absence of dredging projects for the two latter categories may relate to the hard fiscal conditions confronting the municipalities during this period and the expectation by the commercial fishing community that dredging is the obligation of the public agency responsible for operating the port.

Two questions addressed problems related to both past and future dredging needs and concerned the quality of the dredged material. This issue has received as much attention as the quantity of the dredged material, and may, in some cases, have a greater bearing on environmental impact.

Table III-3-4 sought to identify the number of respondents who had undertaken qualitative tests of the sediments, while Table III-3-5 attempts to identify the nature of the sediment without seeking to determine whether and to what degree these sediments were polluted. The sediment testing question is a very important one, although there was considerable reluctance or, more likely, inability to respond to this question (35% in MA, 10.8% in RI). Pollution levels would have to be determined through more detailed sedimentary analysis.

With this in mind, slightly less than one quarter to one third of the projects included in our analysis had tests undertaken with an additional 10-12% not being sure. The balance, 55 and 64% in Massachusetts and Rhode Island, respectively, either had not conducted tests or did not respond to this question.

Five major sediment types make up about 2/3 of the projects included in the Rhode Island analysis, with mud, sand and silt constituting the predominant types. Shells, while a distinct sediment type, are found only in conjunction with two or more of the primary sediment types (Table III-3-5). The same general sediment types were identified in the Massachusetts survey, however, sand is by far the predominant class (57.8%). This is not surprising, considering the high energy physical regime of southern Cape Cod.

3.2 Future Dredging Needs

In the Rhode Island survey, the projects included in

Table III-3-4

Summary of Sediment Testing Prior to Dredging

	RI		MASS	
	#	% of Total	#	% of Total
Number of Respondents Who Had Undertaken Sediment Tests	69	23.4	55	33.7
Number of Respondents Who Were Not Sure	37	12.5	17	10.4
Number of Respondents Who Had Not Undertaken Sediment Tests	157	53.2	34	20.9
Number of Questionnaires Not Responded To	32	10.8	57	35.0
TOTAL NUMBER INTERVIEWED	295	100.0	163	100.0

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Table III-3-5

Perceptions of Predominant Sediment Composition

Type	RI #	RI % of Total Responding	MASS #	MASS % of Total Responding
Mud	75	30.1	2	4.4
Silt	25	10.0	5	11.1
Sand	47	18.9	26	57.8
Gravel	11	4.4	1	2.2
Rock	7	2.8	1	2.2
Mud & Silt	10	4.0	1	2.2
Mud & Sand	25	10.0	4	8.9
Silt & Sand	13	5.2	5	11.1
Other (Shells, etc.)	36	14.4	0	0
TOTAL RESPONDING	249	99.8	45	100.0

the analysis were about evenly divided between those anticipating a demand for dredging during the next ten years (44.7%) and those not anticipating any such needs (45.4%). In Massachusetts, there were a higher number of respondents anticipating dredging, 63.8%, while 33.1% had no dredging needs during the next ten years. Approximately 3% or less were unable to respond to this question, probably because a sedimentation history has not yet been established (Table III-3-6).

Of those facilities which expect to dredge during the next decade, nearly half were marinas and boatyards, followed by private, municipal, and federal project areas; yacht, fishing, and other recreational clubs; state facilities; and commercial ports and terminals. Fishing ports again played a minor role in both states (Table III-3-7).

Tables III-3-8 and III-3-9 identify the potential impacts to those projects that require future dredging in the event that no dredging occurs. The data included in Table III-3-6 suggests that 132 and 104 projects in RI and MA, respectively, will require further dredging, yet Table III-3-8 indicates that a greater number of the projects will be severely affected without future dredging. While these two tables may appear inconsistent, the question on which Table 3-8 was based was speculative, and did not, a priori, infer a need. Undoubtedly, all of the projects included in this study are also included in Table III-3-6. A number of additional respondents who answered this question do not presently anticipate a need during the next ten years. With these qualifications, it appears that more dredging projects will be required related to all aspects of recreational boating (Table III-3-9), which tends to reinforce information collected from past dredging operations. Berths and slips, channels and a combination of the two are the predominant impact types.

In Rhode Island, total demand for dredging of 3.7 million cubic yards was identified with nearly two thirds of the volume related to expansion of existing facilities and the balance identified as maintenance dredging (Table III-3-10). In Massachusetts, that demand is similar with 87.3% of the dredging needs necessary for expansion. Table III-3-10b compares federal versus non-federal projects. It should be noted here that estimates of sediment to be dredged are based only on the perceptions of the facility operator. They were given no guidelines as to dredging methods or how they should make estimates. Where hard data were not available, they should be viewed as rough estimates. In addition, some respondents indicated a need to dredge, but did not say how much material would need to be removed. The estimates are, therfore, on the conservative side.

Several questions dealt with the quantity of material to be dredged. As would be expected, future estimates are considerably higher than past dredging activities would suggest. Several reasons may account for this. First, the time horizon of the two periods (past and future) is not identical. The past

Table III-3-6

Projected Dredging Needs

	RI		MASS	
	#	% of Total	#	% of Total
Number of Respondents Anticipating Dredging Between 1985-1995	132	44.7	104	63.8
Number of Respondents Not Anticipating Dredging Needs Between 1985-1995	134	45.4	54	33.1
Number of Respondents Unsure As To Future Dredging Needs or Who Did Not Respond	29	9.8	5	3.1
TOTAL	295	100.0	163	100.0

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Table III-3-7

Facilities Expecting Dredging Between 1985-1995

	RI		MASS	
	#	% of Total	#	% of Total
Port Authorities & Shipping Terminals	8	6.1	3	2.9
Recreational Clubs	12	9.2	4	3.9
Commercial Marinas & Boatyards	65	49.2	43	41.7
Fishing Ports	1	0.8	0	0
State Facilities	11	8.3	1	1.0
Municipal Facilities	9	6.8	16	15.5
Private Facilities	13	9.8	22	21.4
Federal Projects	13	9.8	12	11.7
Wholesale Fish Processing Facility	0	0	2	1.9
TOTAL NUMBER OF RESPONDENTS ANSWERING THIS QUESTION	132	100	103	100.0

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TABLE III-3-8

Potential Adverse Impacts in the Event of
No Future Dredging: 1985-1995

Respondents	RI #	RI % of Total	MASS #	MASS % of Total
Number of Respondents Citing No Adverse Impacts	95	33.6	29	18.7
Number of Respondents Citing Adverse Impacts	188	66.4	126	81.3
Total Number of Respondents Answering This Question	283	100.0	155	100.0

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TABLE III-3-9

If No Future Dredging - Types of Functional Impacts

	RI #	RI % of Total	MASS #	MASS % of Total
Berths & Slips	62	35.5	32	34.8
Moorings	2	1.1	5	5.4
Channels	27	15.5	14	15.2
Haul-out Facilities	23	13.1	10	10.9
Berths, Slips & Moorings	1	0.6	5	5.4
Berths, Slips & Channels	31	17.7	6	6.5
Berths, Slips & Haul-out Facilities	13	7.4	5	5.4
Moorings & Channels	5	2.9	2	2.3
Channels and Haul-out Facilities	2	1.1	3	3.3
Berths, Slips, Moorings & Channels	2	1.1	2	2.3
Berths, Slips, Channels and Haul-out Facilities	6	3.4	3	3.3
Berths, Slips, Mooring Areas, Channels & Haul-out Facilities	1	.6	5	5.4
TOTAL	175	100.0	92	100.0

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Table III-3-10A

Projected Volume of Dredged Material by Maintenance vs. Expansion or New Work

	RI		MASS	
	%	Mill $yd.^3$	%	Mill $yd.^3$
Maintenance of Existing Facilities	35.1	1.3	10.9	0.6
Expansion of Existing Facilities	64.9	2.4	87.3	4.8
Both Maintenance & Expansion	0	0	1.4	0.1
TOTALS	100.0	3.7	99.6	5.5

Table III-3-10B

Federal Projects vs. Non-Federal

	RI				MASS	
	#	Past	#	Projected	#	Projected
Federal	(3)	88,000	(12)	495,500	(10)	5,075,740
Non-Federal	(35)	227,106	(35)*	3,101,223	(49)*	649,465
TOTALS	(38)	315,106	(47)	3,596,723	(59)	5,725,205

* These figures refer only to those respondents who provided quantitative estimates.

period only covered five years, while the future dredging needs cover a full ten year period. Perhaps more importantly, the estimates were made without including any constraints such as costs, time, or perceived permitting delays on the part of the respondent. Finally, in assessing the overall demand for dredging, it should be kept in mind that these estimates probably include projects which would have been initiated and completed in the past, had the need for dredging been recognized earlier and had there been a regional disposal site.

Since this study surveyed the projects without allowing for any of the constraints listed above, the figures on which this report is based may be larger than the actual need. To assess this problem, it was decided to review the results of the 1981 Needs Study and compare these estimates with the projects actually undertaken during the 1980-1985 period. The actual dredging which did take place during the 1980-1981 period was, as expected, considerably smaller than would be expected for the 1985-1995 period. Reasons for this, in addition to those already discussed, are that permitting procedures have become relatively easier and many from the fishing industry and the environmental coalition have come to recognize the need for regular dredging of legitimate marine dependent businesses.

The 1981 study identified the need to dredge 1,683,902 yd^3 in Rhode Island, or about 45% of the 3.7 million yd^3 projected in RI for the 1985-1995 period. However, only 343,727 yd^3 of the 1981 identified need were actually dredged. This represents about 20% of the amount the respondents identified. Considering the very liberal assumptions and the many unknown factors influencing the needs for future dredging in Rhode Island, one should not infer that this coefficient (.20) will hold for the future. Chances are good that the actual amount of material dredged will be greater than 750,000 yd^3 (representing 21% of 3.56 million yd^3) and less than the maximum amount identified in the present study.

Conversely, it is also possible that the total estimates may be lower than the actual need. Some respondents indicated a need, but made no estimate as to the quantity of material to be removed. The relative importance of the causes for errors in the projected dredging needs is at this time unknown.

Of the 119 Rhode Island projects included in this part of the analysis, berths and slips again account for the largest group of projects and largest volume of material to be dredged (Table III-3-11). This table is interesting because of the high correlation between the number of projects in each category and the amount of anticipated material to be dredged. Of the four distinct functional categories, berths and slips, channels, mooring areas, and haul-out facilities, only the haul out facilities account for a disproportionately small percentage of material (.8%) compared to the number of identified projects (12 or 10%).

Table III-3-11

Projected Volume of Dredged Material
By Type of Function - Rhode Island

	RI			
	#	%	yd^3	%
Berths & Slips	46	38.7	1,373,353	36.5
Channels	8	6.7	395,890	10.5
Mooring Areas	1	0.8	25,000	0.7
Haul-out Facilities	12	10.1	30,090	0.8
All of the Above	1	0.8	58,400	1.5
Berths, Slips & Channels	21	17.6	1,424,715	42.4
Berths, Slips & Moorings	1	0.8	4,500	0.1
Berths, Slips & Haul-out Facilities	17	14.3	79,700	2.1
Channels & Moorings	3	2.5	80,000	2.1
Berths, Slips, Channels, & Haul-out Facilities	9	7.5	116,846	3.1
TOTAL NUMBER OF RESPONDENTS ANSWERING THIS QUESTION	119			
TOTAL PROJECTED VOLUME			3,563,519	

In the Massachusetts survey (Table III-3-12), channel maintenance accounts for 83.8% of the anticipated dredging volume. These estimates are not directly related to recreational boating needs, as in Rhode Island, but with the channel maintenance and improvement of Fall River Harbor.

What these tables do not address is the relationship between projects. Thus, no dredging immediately surrounding existing berths or slips will accomplish its intended purpose if the channel leading to the marina or shipping terminal is so shallow as not to service the intended clientele. Similarly, it does not make a great deal of sense to dredge haul-out facilities if the marina or yacht club equipment is unable to handle boats the size of which the haul-out facility is intended to service. Both types of projects should be identified as expansion.

These comments are directly related to the types of impacts a given facility would confront in the event that no future dredging were to take place. No economic impacts were sought even though in the final analysis such information may be necessary and of utmost importance to the individual facility. Such analysis simply was not possible given the very limited time available. Instead, information related to the type of impacts which would occur was sought in the RI survey as an additional feature. This information appears in Table III-3-13. Not surprisingly, all responses are negative in the sense that some action would be required by the operator to cope with the conditions at hand. Of equal importance is that all dredging activities imply some adverse impacts to the operator of the facility and perhaps to the consuming public as well.

More than 43% mentioned moving from larger to smaller boats as one coping mechanism. A surprisingly small number thought of moving from sail to power, which might be the one option that would minimize the economic impacts. Since sailboats have deeper drafts compared with powerboats of equal length and cost, a switch from one to the other may minimize the impacts associated with a shallow waterbody. Some impacts would result however, as marinas are beginning to cater to one type as opposed to the other. Boating, while involving an increasingly broad spectrum of the general public, is becoming more and more specialized. Sailboats require services (sail lofts, riggers and haul-out facilities) which are either non-existent or different for power boats. Similarly, power boats have greater needs for some services which are smaller or absent in the case of sailboats. To change a facility from catering to one type of boat group to another may require an extensive investment, which many marina operators would find difficult if not impossible to make.

In answer to the question on preferred disposal option, 40% of the respondents in Rhode Island preferred to dispose of the material on either public or private land (Table III-3-14). A number indicated that they would prefer to dispose of the material within their own operations or as part of fill for uses such as extending bulkheads. The quantity of material associated with

Table III-3-12

Projected Volume of Dredged Material
By Type of Function - Massachusetts

	MASS			
	#	%	yd^3	%
Berths & Slips	17	34.7	27,625	0.5
Channels	5	10.2	4,345,000	83.8
Mooring Areas	2	4.1	1,400	0.02
Haul-out Facilities	4	8.2	4,290	0.1
All of the Above	2	4.1	15,600	0.3
Berths, Slips & Channels	5	10.2	8,950	0.2
Berths, Slips & Moorings	1	2.0	10,000	0.2
Berths, Slips & Haul-out Facilities	2	4.1	6,000	0.02
Channels & Moorings	1	2.0	5,000	0.1
Channels & Haul-out	2	4.1	10,100	0.2
Haul-out, Berths & Slips	1	2.0	10,000	0.2
Berths, Slips, Channels & Moorings	2	4.1	38,500	0.7
Berths, Slips, Channels & Haul-out	1	2.0	534,470	10.3
Berths, Slips, Moorings & Haul-out	1	2.0	10,000	0.2
Channels, Moorings & Haul-out	3	6.1	155,000	3.0
TOTAL NUMBER OF RESPONDENTS ANSWERING THIS QUESTION	49	100.0		
TOTAL PROJECTED VOLUME			5,181,935	

TABLE III-3-13

Types of Impacts with No Future Dredging - Rhode Island

	RI #	RI % of Total
Facility would have to move from larger to smaller boats	52	43.3
Facility would have to move from sail to power boats	3	2.6
Overall limit to growth	25	20.9
Facility would have to move from larger to smaller boats, as well as move from servicing sail to power boats	8	6.6
Facility would have to move from larger to smaller boats which would limit growth opportunities for the facility	8	6.6
Facility would have to close	24	20.0
Total number of respondents	120	100.0

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Table III-3-14

PREFERRED DISPOSAL OPTIONS

	Rhode Island #	Rhode Island yds.^{3}	Rhode Island %	Massachusetts #	Massachusetts yds.^{3}	Massachusetts %
Public Land	17	128,795	3.5	9	53,160	0.9
Private Land	33	154,463	4.3	5	2,860	0.04
In-Water Near Operation	20	1,471,373	40.9	9	4,227,580	73.8
In-Water Away From Operation	16	1,351,135	37.6	2	25,000	0.4
Uncertain	21	229,322	6.4	33	1,403,335	24.5
Would Choose Cheapest Disposal Site	4	25,300	0.7	0	0	0
Multiple Response	14	236,335	6.6	1	13,000	0.2
TOTALS (for those who answered this question)	125	3,596,723	100.0	59	5,724,935	99.8

these responses, however, was only 7.8% of the total. The larger operations, 28.8% of the responses, preferred to dispose of the material in the water, either near or far away from the facility. These quantities amounted to 78.5% of the total. The pattern of response was the same in Massachusetts, where 23.7% of the respondents preferred land disposal versus 18.6% preferring disposal in water. Again, the preference for disposal in water accounted for the majority of material, being 74.2% of the total.

The majority of respondents in each state saw the need to dredge at least every ten years (Table III-3-15), with the urgency for dredging more evident in Massachusetts (84.3%). This is probably because very little dredging has occurred in Southeastern Massachusetts over the last five years.

In response to the question regarding the maximum limiting distance for disposal, there were less than 4% responding in the Rhode Island survey. The mean fouling distance for these respondents was 28 miles. Six of the 11 responses ranged from 5 to 25 miles, and the remaining 5 responses from 35-70 miles. In Massachusetts, responses were given in only 16 townships (Table 3-16) and indicated an average mean limiting distance of 11 miles. The low response to this question, especially in Rhode Island, reflects the general apathy of the respondents regarding the chance of any open water disposal.

4.0 REGIONAL ANALYSIS

4.1 Rhode Island

The regional analysis is divided into three parts. The first consists of a discussion and description of the demand by townships. The second part is a brief regional analysis based on the clustering of boatyards, fishing ports and other facilities. Since the development of these facilities is based on the physical characteristics of the shoreline, the distribution of the facilities does not necessarily follow established municipal boundaries. Finally, the raw data on which this analysis is based is presented both graphically and in tabular forms, in Appendix: Table 3.

The information on which this analysis is based has been assembled in a series of comparative tables to summarize the pertinent data across the 21 municipalities which make up the Rhode Island shoreline. These are presented in Tables III-4-1 through III-4-11 on the following pages.

As indicated in Section 2.0, a very distinct regional distribution is presented in the type of water-dependent facilities with a demand for dredging. Ports and terminals are concentrated at the head of Narragansett Bay (Providence and East Providence) and the Sakonnet River (Tiverton). Commercial marinas and the few fishing ports are in the southern part of the state. Recreational boat clubs, private, municipal and federal facilities are distributed nearly randomly along the shoreline.

TABLE III-3-15

FREQUENCY OF FUTURE DREDGING NEEDS

	RI #	RI %	MASS #	MASS %
More Frequent than every 5 years	27	17.5	39	47.0
5.1 - 10 years	66	42.9	31	37.3
10.1 - 15 years	22	14.3	8	9.6
15.1 - 20 years	25	16.2	3	3.6
Every 20 years or more	14	9.1	2	2.4
Total Number of Respondents	154	100.0	83	100.0

Table III-3-16

Minimum, Maximum, and Mean Limiting Distance for Disposal of Those Townships Responding

	Mean Distance	Maximum Distance	Minimum Distance
Bourne	28.5	50.0	7.0
Chatham	13.3	20.0	0.0
Edgartown	20.0	20.0	20.0
Fairhaven	25.0	30.0	20.0
Harwich	2.0	2.0	2.0
Hyannis	2.5	5.0	0.0
Marion	12.5	20.0	5.0
Mattapoisett	7.5	10.0	5.0
Nantucket	5.0	5.0	5.0
Onset	0.0	0.0	0.0
Osterville	1.5	3.0	0.0
S. Dartmouth	5.0	10.0	0.0
S. Yarmouth	10.0	10.0	10.0
Vineyard Haven	15.0	15.0	15.0
Wareham	15.0	15.0	15.0
Falmouth	12.5	25.0	0.0

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Table III-4-1. RI - Projection By Type Of Facility

Township	Ports Terminals		Boat Clubs		Commercial Marinas		Fishing Ports		State		Private		Federal		Municipal	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Westerly	0	0	3	18.8	11	68.8	0	0	0	0	0	0	1	6.3	1	6.3
Charlestown	0	0	0	0	2	28.6	0	0	3	42.9	2	28.6	0	0	0	0
South Kingstown	0	0	2	8.7	15	65.2	0	0	1	4.4	1	4.4	1	4.4	3	13.0
Narragansett	0	0	0	0	0	0	1	7.7	4	30.8	4	30.8	4	30.8	0	0
Block Island	2	16.7	0	0	5	41.7	0	0	0	0	1	8.3	2	16.7	2	16.7
North Kingstown	0	0	4	26.7	6	40	0	0	1	6.7	1	6.7	0	0	3	20
Jamestown	0	0	1	11.1	4	44.5	0	0	1	11.1	0	0	0	0	3	33.3
East Greenwich	0	0	1	11.1	4	44.5	0	0	0	0	2	22.2	0	0	2	22.2
Warwick	0	0	2	5.6	12	33.3	0	0	5	13.9	3	8.3	2	5.6	12	33.3
Cranston	0	0	3	60.0	2	40.0	0	0	0	0	0	0	0	0	0	0
East Providence	6	54.6	1	9.1	3	27.3	0	0	0	0	0	0	0	0	1	9.1
Providence	18	81.8	0	0	1	4.6	0	0	0	0	1	4.6	1	4.6	1	4.6
Pawtucket	1	50	0	0	0	0	0	0	0	0	0	0	1	50.0	1	50.0
Barrington	0	0	1	14.3	4	57.1	0	0	1	14.3	0	0	0	0	1	14.3
Warren	0	0	0	0	4	30.8	1	7.7	0	0	7	53.9	0	0	1	7.7
Bristol	0	0	1	7.7	1	7.7	0	0	7	53.9	0	0	1	7.7	3	23.1
Portsmouth	0	0	0	0	7	70.0	0	0	2	20.0	1	10.0	0	0	0	0
Middletown	0	0	0	0	0	0	0	0	0	0	1	100.0	0	0	0	0
Newport	0	0	4	10.0	13	33.3	2	5.1	2	5.1	8	20.5	2	5.1	8	20.5
Tiverton	2	16.7	1	8.3	2	16.7	0	0	0	0	1	8.3	2	16.7	4	33.3
Little Compton	0	0	1	20.0	2	40.0	0	0	0	0	1	20.0	0	0	1	20.0
	28	10.0	25	8.9	98	35.0	4	1.4	28	10.0	34	12.1	17	6.1	46	16.4

Table III-4-2. RI - Future Dredging Plans

Township	Plan To Dredge		No Plans To Dredge		Unsure	
	#	%	#	%	#	%
Westerly	13	81.3	3	18.7	0	0
Charlestown	5	71.4	2	28.6	0	0
S. Kingstown	10	43.5	10	43.5	3	13.0
Narragansett	7	53.9	5	38.5	1	7.6
Block Island	5	41.7	5	41.7	2	16.6
N. Kingstown	4	26.7	10	66.7	1	6.6
Jamestown	6	66.7	3	33.3	0	0
E. Greenwich	4	44.4	5	55.6	0	0
Warwick	17	47.2	18	50.0	1	2.8
Cranston	4	80.0	1	20.0	0	0
E. Providence	6	54.6	5	45.5	0	0
Providence	6	27.2	12	54.6	4	18.2
Pawtucket	2	100.0	0		0	0
Barrington	3	42.9	4	57.1	0	0
Warren	9	69.2	4	30.8	0	0
Bristol	2	15.4	10	76.9	1	7.7
Portsmouth	6	60.0	3	30.0	1	10.0
Middletown	1	100.0	0	0	0	0
Newport	14	35.9	25	64.1	0	0
Tiverton	2	16.7	9	75.0	1	8.3
Little Compton	2	40.0	3	60.0	0	0

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Table III-4-3. RI - How Has Your Operation Been Affected By No Dredging

Township	No Effect		Berths & Slips		Moorings		Channels		Haul-out		Multiple Impacts	
	#	%	#	%	#	%	#	%	#	%	#	%
Westerly	1	7.7	5	38.5	0	0	3	23.1	0	0	4	7.7
Charlestown	1	14.3	0	0	0	0	2	28.6	2	28.6	2	28.6
S. Kingstown	3	13.0	4	17.5	0	0	5	21.7	3	13.0	8	34.8
Narragansett	4	30.8	2	15.4	0	0	2	15.4	1	7.7	4	30.7
Block Island	4	33.3	0	0	0	0	6	50.0	0	0	2	16.7
N. Kingstown	6	40.0	3	20.0	0	0	3	20.0	1	6.7	2	13.3
Jamestown	2	22.2	0	0	0	0	0	0	4	44.4	3	33.3
E. Greenwich	5	55.6	1	11.1	0	0	2	22.2	1	11.1	0	0
Warwick	9	25.7	7	20.0	0	0	1	2.9	10	28.6	8	22.9
Cranston	1	20.0	2	40.0	0	0	0	0	0	0	2	40.0
E. Providence	5	45.6	4	36.4	0	0	0	0	0	0	2	18.2
Providence	14	63.6	7	31.8	0	0	1	4.6	0	0	0	0
Pawtucket	0	0	0	0	0	0	1	50.0	0	0	1	50.0
Barrington	2	28.6	2	28.6	0	0	0	0	0	0	3	42.9
Warren	6	41.2	4	30.8	0	0	0	0	1	7.7	2	15.4
Bristol	8	61.5	0	0	0	0	0	0	1	7.7	4	30.8
Portsmouth	5	50.0	2	20.0	0	0	0	0	2	20.0	1	10.0
Middletown	0	0	1	100.0	0	0	0	0	0	0	0	0
Newport	26	66.7	6	15.4	0	0	2	5.1	0	0	5	12.8
Tiverton	8	66.7	3	25.0	1	8.3	0	0	0	0	0	0
Little Compton	1	20.0	1	20.0	0	0	1	20.0	1	20.0	1	20.0

Table III-4-4. RI - Type Of Operation Function That Will Be Affected If No Dredging Takes Place During The Period 1985-1995?

Township	No Effect		Berths & Slips		Moorings		Channels		Haul-out		Multiple Impacts		Unsure	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Westerly	1	7.1	5	35.8			3	21.4					5	35.7
Charlestown			1	14.3			3	42.9	2	28.3			1	14.3
South Kingstown	2	8.7	7	30.4			4	17.4	2	8.7	1	4.4	7	30.4
Narragansett	4	30.8	1	7.7			2	15.4					6	46.2
Block Island	3	25.0					2	16.7					7	58.3
North Kingstown	5	33.3	2	13.3			3	20.0	1	6.7			3	20.0
Jamestown	2	22.2	1	11.1					4	44.4			2	22.2
East Greenwich	4	44.4	1	11.1			2	22.2	1	11.1			1	11.1
Warwick	10	27.8	8	22.2			1	2.8	8	22.2			9	25.0
Cranston	1	20.0	3	60.0									1	20.0
East Providence	5	45.5	2	18.2									4	36.4
Providence	9	40.9	10	45.6									3	13.6
Pawtucket							1	50.0					1	50.0
Barrington	3	42.9	1	14.3									3	42.9
Warren	3	23.1	7	53.9					1	7.7			2	15.4
Bristol	7	53.9					1	7.7	1	7.7			4	30.8
Portsmouth	3	30.0	1	10.0			1	10.0	2	20.0			3	30.0
Middletown													1	100.0
Newport	24	61.5	8	20.5			3	7.7					4	10.3
Tiverton	8	66.7	3	25.0	1	8.3								
Little Compton	1	20.0	2	40.0					1	20.0			1	20.0
	95	34.2	63	22.7	1	100.0	26	9.4	23	8.3	1	.4	69	24.8

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Table III-4-5. RI - Given That There Will Be An Adverse Impact If There Is No Future Dredging, How Does The Facility Respond?

Township	Large to Small Craft		Sail to Power Craft		Close		Limit Growth		Multiple Impacts	
	#	%	#	%	#	%	#	%	#	%
Westerly	3	37.5	1	12.5	3	37.5	1	12.5		
Charlestown					1	33.3	1	33.3	1	33.3
South Kingstown	7	63.6			2	18.2	1	9.1	1	9.1
Narragansett	2	40.0					2	40.0	1	20.0
Block Island					1	33.3	2	66.7		
North Kingstown	3	37.5			2	25.0	1	12.5	2	25.0
Jamestown	3	50.0			2	33.3			1	16.7
East Greenwich	3	100.0								
Warwick	9	47.4	1	5.3	3	15.8	2	10.5	4	21.1
Cranston					2	100.0				
East Providence	1	20.0			1	20.0	2	40.0	1	20.0
Providence	2	20.0			4	40.0	4	40.0		
Pawtucket	1	100.0								
Barrington	1	25.0			1	25.0	1	25.0	1	25.0
Warwick	3	42.9					4	57.1		
Bristol	3	100.0								
Portsmouth	2	33.3	1	16.7			3	50.0		
Middletown									1	100.0
Newport	5	45.6			2	18.2	2	18.2	2	18.2
Tiverton	3	100.0								
Little Compton	1	100.0								

Table III-4-6. RI. Do You Plan To Use The Same Disposal Site That Was Used Before?

Township	Yes		No		Unsure		No Response	
	#	%	#	%	#	%	#	%
Westerly	5	31.3	2	12.5			9	56.2
Charlestown	7	100.0						
S. Kingstown	4	16.7					20	83.3
Narragansett	1	7.7	1	7.7	1	7.7	10	76.9
Block Island	4	25.0					8	75.0
N. Kingstown	1	6.3	1	6.3			14	87.4
Jamestown	1	11.1					8	88.9
E. Greenwich	1	11.1	1	11.1			7	77.8
Warwick	1	2.4					40	97.6
Cranston							5	100.0
E. Providence	2	18.2					9	81.8
Providence	1	4.5	1	4.5			20	91.0
Pawtucket							2	100.0
Barrington			1	14.2			6	85.8
Warren	2	15.4			1	7.7	10	76.9
Bristol							15	100.0
Portsmouth	1	10.0	1	10.0	1	10.0	7	70.0
Middletown							1	100.0
Newport	1	2.5			1	2.5	38	95.0
Tiverton	1	7.7					12	92.3
Little Compton							5	100.0
	33	11.3	8	2.7	4	1.4	246	84.5

Table III-4-7. RI. How Do You Plan To Dispose Of The Sediment?

Township	Public Land		Private Land		In Water Near Operation		In Water Away From Site		Combined	
	#	%	#	%	#	%	#	%	#	%
Westerly	2	15.4	6	46.2	1	7.7	3	23.1	1	7.7
Charlestown	3	50.0	2	33.3	1	16.8				
S. Kingstown	1	9.1	8	72.7			2	18.2		
Narragansett	7	77.8	1	11.1			1	11.1		
Block Island	3	33.3	2	22.2			4	44.4		
N. Kingstown	2	25.0	1	12.5	1	12.5	4	50.0		
Jamestown			1	16.7	1	16.7	4	66.7		
E. Greenwich	1	25.0	1	25.0			2	50.0		
Warwick	5	27.8	8	44.4			3	16.7	2	11.2
Cranston			1	25.0			2	50.0	1	25.0
E. Providence			3	50.0	1	16.7	1	16.7	1	16.7
Providence			1	12.5	1	12.5	6	75.0		
Pawtucket					1	50.0	1	50.0		
Barrington			2	50.0			2	50.0		
Warren			5	50.0			5	50.0		
Bristol	1	25.0					3	75.0		
Portsmouth			2	33.3	1	16.7	1	16.7	2	33.3
Middletown					1	100.0				
Newport			2	14.3	1	7.1	10	71.4	1	7.1
Tiverton			1	33.3			2	67.7		
Little Compton			2	100.0						

Table III-4-8. RI - Volume of Past and Future Dredging Activities (in cubic yards)

Township	PAST[1]	FUTURE[2]			PERCENT			AV.
	Total Vol.	Expansion	Maintenance	Unspec.	Exp.	Maint.	Unspec.	Project
Westerly	16,665		59,510	21,700		73	27	5,075
Charlestown	0		150,610	850		95	5	2,273
South Kingstown	108,450	23,000	68,633	11,050	22	67	11	4,464
Narragansett	25,450		21,200					1,631
Block Island	49,200	15,000	25,000	37,000	19	33	48	5,133
North Kingstown	980	1,250,000	48,065	0	96	4		86,537
Jamestown	329		8,300	1,950		81	19	1,139
E. Greenwich	3,770		3,085					342
Warwick	120	97,000	93,140	30,700	44	42	14	6,134
Cranston	0			26,100			100	52,500
E. Providence	41,660	502,500	3,400		99	1		45,990
Providence	10,000	5,200	547,500		1	99		25,123
Pawtucket	0		35,000			100		17,500
Barrington	3,000		270	50,575		1	99	7,264
Warren	975	9,400	5,165	1,100	60	33	7	1,205
Bristol	0		4,500			100		346
Portsmouth	6,107	26,500		40,000	39		40	6,650
Middletown	0			58,400			100	58,400
Newport	38,000	368,000	10,537		97	3		9,706
Tiverton	10,000		35,000					2,917
Little Compton	0		2,200	5,000		31	69	1,440

1 = 1980-1985
2 = 1985-1995

Table III-4-9. RI - Tests on Sediment Composition

Township	YES #	YES %	NO #	NO %	UNSURE #	UNSURE %
Westerly	5	33.3	10	66.7	0	0
Charlestown	1	14.3	4	57.1	2	28.6
South Kingstown	6	27.3	12	54.6	4	18.2
Narragansett	2	15.4	6	46.2	5	38.5
Block Island	2	20.0	5	50.0	3	30.0
North Kingstown	2	14.3	11	78.6	1	7.1
Jamestown	0	0	8	88.9	1	11.1
E. Greenwich	2	22.2	4	44.5	3	33.3
Warwick	19	57.6	13	39.4	1	3.0
Cranston	3	60.0	2	40.0	0	0
E. Providence	5	45.5	5	45.5	1	9.0
Providence	4	22.2	9	50.0	5	27.8
Pawtucket	1	50.0	0	0	1	50.0
Barrington	2	33.3	4	66.7	0	0
Warren	3	25.0	8	66.7	1	8.3
Bristol	0	0	10	88.3	2	16.7
Portsmouth	1	10.0	8	80.0	1	10.0
Middletown	0	0	1	100.0	0	0
Newport	8	21.1	26	68.4	4	10.5
Tiverton	1	8.3	9	75.0	2	16.7
Little Compton	2	40.0	3	60.0	0	0

Table III-4-10. RI - Sediment Types

Township	Mud		Silt		Sand		Gravel		Rock		Combination	
	#	%	#	%	#	%	#	%	#	%	#	%
Westerly	1	6.7	2	13.3	1	6.7	3	20.0	1	6.7	7	46.7
Charlestown	0	0	0	0	1	14.3	1	14.3	1	14.3	4	57.1
South Kingstown	6	26.1	2	8.7	2	8.7	1	4.4	0	0	12	52.3
Narragansett	1	7.7	1	7.7	5	38.5	0	0	1	7.7	5	38.5
Block Island	0	0	0	0	7	58.3	0	0	0	0	5	41.7
North Kingstown	6	46.2	0	0	2	15.4	0	0	0	0	5	38.5
Jamestown	0	0	0	0	5	62.5	0	0	0	0	3	37.5
East Greenwich	4	50.0	2	25.0	2	25.0	0	0	0	0	0	0
Warwick	11	34.4	3	9.4	7	21.9	3	9.4	0	0	8	25.0
Cranston	0	0	1	50.0	1	50.0	0	0	0	0	0	0
East Providence	2	28.6	1	14.3	0	0	1	14.3	0	0	3	42.9
Providence	6	42.9	3	21.4	1	7.1	0	0	0	0	4	28.6
Pawtucket	0	0	2	100.0	0	0	0	0	0	0	0	0
Barrington	2	33.3	0	0	1	16.7	0	0	1	16.7	2	33.3
Warren	5	38.5	1	7.7	1	7.7	0	0	0	0	6	46.2
Bristol	5	62.5	0	0	1	12.5	1	12.5	0	0	1	12.5
Portsmouth	0	0	1	10.0	2	20.0	1	10.0	0	0	6	60.0
Middletown	0	0	0	0	0	0	0	0	0	0	1	100.0
Newport	20	52.3	3	7.9	3	7.9	0	0	4	10.3	8	21.1
Tiverton	5	45.6	2	18.2	2	18.2	0	0	0	0	2	18.2
Little Compton	0	0	0	0	2	40.0	0	0	0	0	3	60.0

SAIC

Table III-4-11. RI - How Frequently Do You Need To Dredge?

Township	Less Than 5yrs		5.1 - 10yrs		10.1 - 15yrs		15.1 - 20yrs		More Than 20yrs		Unsure	
	#	%	#	%	#	%	#	%	#	%	#	%
Westerly	3	20.0	6	40.0	0	0	2	13.3	3	20.0	1	6.7
Charlestown	3	50.0	1	16.7	1	16.7	0	0	1	16.7	0	0
South Kingstown	0	0	10	45.5	4	18.2	3	13.6	2	9.1	3	13.6
Narragansett	2	15.4	4	30.8	0	0	2	15.4	3	23.1	2	15.4
Block Island	4	33.3	2	16.7	0	0	0	0	4	33.3	2	16.7
North Kingstown	1	6.7	0	0	6	40.0	2	13.3	6	40.0	0	0
Jamestown	1	12.5	3	32.5	1	12.5	0	0	3	37.5	0	0
East Greenwich	0	0	4	44.5	0	0	0	0	2	22.2	3	33.3
Warwick	5	14.7	7	20.6	4	11.8	3	8.8	11	32.4	4	11.8
Cranston	0	0	3	60.0	0	0	2	40.0	0	0	0	0
East Providence	1	10.0	2	20.0	0	0	2	20.0	1	10.0	4	40.0
Providence	1	5.0	6	30.0	1	5.0	1	5.0	6	30.0	5	25.0
Pawtucket	0	0	2	100.0	0	0	0	0	0	0	0	0
Barrington	1	14.3	1	14.3	0	0	2	28.6	3	42.9	0	0
Warren	0	0	4	36.4	1	9.1	1	9.1	4	36.4	1	9.1
Bristol	0	0	0	0	0	0	1	8.3	5	41.7	6	50.0
Portsmouth	1	10.0	1	10.0	2	20.0	1	10.0	4	40.0	1	10.0
Middletown	0	0	1	100.0	0	0	0	0	0	0	0	0
Newport	4	10.8	5	13.5	3	8.1	1	2.7	22	59.5	2	5.4
Tiverton	0	0	3	25.0	0	0	1	8.3	8	66,7	0	0
Little Compton	0	0	0	0	1	25.0	1	25.0	2	50.0	0	0
	27	10.1	65	24.5	24	9.1	25	9.4	90	34.0	34	12.8

SAIC

4.1.1 Geographical Areas

Charlestown

Only seven operators were identified in Charlestown. The reader is cautioned when interpreting the relative responses since the small sample size in one category will statistically bias the analysis. State facilities comprise the largest category with commercial boat facilities (marinas and boatyards) and private respondents making up the balance (Table III-4-1). The sedimentation problems associated with the Charlestown Breachway and the considerable flood tidal delta created in the pond represents one of the major coastal issues at the present time. Five of the seven respondents (71%) expected to require dredging within the next 10 years (Table III-4-2). All but one respondent had been adversely affected by the absence of dredging during the 1980-1984 period, with channels and haul-out facilities being especially impacted (Table III-4-3). Similarly, all respondents expect to require some dredging within the next ten years. The problem of inadequate channel depths appears to be the major problem, followed by inadequate depths at haul-out facilities, and around the berths and slips (Table III-4-4). In the event of a "no future dredging" policy, severe impacts to future growth could ensue, including closing the facility (Table III-4-5).

All of the respondents expect to dispose of dredged materials at previously used sites (Table III-4-6). Since much of the land in Charlestown is managed by the public sector, 50% of the respondents saw disposal on public land as the preferred option, followed by the private land and "in the water near the proposed operation" as viable disposal options (Table III-4-7).

None of the respondents reported dredging during the 1980-1985 period, yet nearly 16,000 yds^3 have been projected for the 1985-1995 period, most of which is identified as maintenance dredging (Table III-4-8). Only one respondent had undertaken tests on the quality of the sediment (Table III-4-9), although all were aware of the type of sediments characterizing their sites. Nearly half of the respondents cited combinations of sand, gravel and rocks with the balance of the respondents believing the sediment types were made up of two or more types (Table III-4-10). The perceived frequency of dredging tends to corroborate previous responses with 50% of those responding expecting dredging to be required within the next five years (Table III-4-11).

Westerly

Considering the number of respondents located in Westerly (16), (Table III-4-1), a high proportion of these facilities expect to dredge within the next 10 years (81.3%) (Table III-4-2) compared to the state as a whole (45.7%). Nearly 3/4 of the projected volume (81,210 cubic yards) (Table III-4-2) is considered maintenance. About one third of the respondents expect to use the same disposal sites as in the past, nearly half of the respondents (46.2%) preferred disposal on private land, with the majority suggesting that their own land be used.

This response is undoubtedly related to the high number (twelve out of thirteen) of respondents who claimed adverse impacts to their operations as a result of no dredging (Table III-4-3). The areas especially in need of dredging in the past included berths and slips as well as access channels. The past experience appears to have influenced the respondents' perception of future impacts in the event dredging does not become a reality (Table III-4-4). When analyzing the specific impacts and the remedies available to the respondents, 37.5% mentioned closing the facility as a distinct possibility. Other coping strategies included changing the service from larger to smaller boats and from sail to power (12.5%) (Table III-4-5).

About one third had undertaken tests of the sediments, nearly half of which was made up of a combination of mud, silt, sand, gravel and rock (Table III-4-10). The perceived need of dredging is significantly greater than for the state as a whole. Twenty percent of the Westerly respondents felt a need to dredge as frequently as once every five years with an additional 40% of the opinion that dredging would be required between 5 and 10 years (Table III-4-11). It is likely that the high energy regime characterizing the western portion of the state are such that maintenance dredging poses especially severe constraints on the operators located there.

South Kingstown

South Kingstown is the largest municipality in Rhode Island and also one of the communities with the greatest number of water-dependent operations (Table III-4-1). As indicated above, most of the facilities in the state's southern region are devoted to recreational boating. About half of those responding expected to require some dredging within the next ten years (Table III-4-2). Since all of the facilities are located on salt ponds with the attendant problems of siltation, and since dredging activities have been quite limited during the 1980-1985 period, it is not surprising that 87% of the 23 South Kingstown respondents identified adverse impacts to their operations during this period. What perhaps is surprising is the area of perceived problems which includes channels (22%), berths and slips (17%), haul-out facilities (13%) and combinations thereof (35%), (Table III-4-3). This relatively wider distribution is probably related to the distribution of facilities on the Salt Pond and the importance which this water body has on both fishing and commercial shipbuilding.

Projecting the needs for the 10 year planning period, dredging around berths and slips is mentioned by about 30%, followed by channel dredging. The relatively greater emphasis on recreational boating in South Kingstown is probably a reflection of the significant growth in boating which has taken place in Rhode Island and the extent to which Rhode Island services boating needs for Connecticut and Massachusetts.

Projecting adverse impacts and strategies which the operators are likely to adopt reflect the less severe conditions which the Salt Pond is subjected to compared to some of the ponds in Charlestown and Westerly. The preferred coping mechanism by the South Kingstown marina operator is to move from the service of large boats to smaller, more shallow drafted boats. Only 18% referred to closing the facility as a distinct possibility (Table III-4-5).

The response concerning the preferred disposal site of the South Kingstown respondents was basically inconclusive. Fewer than 17% (Table III-4-6) preferred the previous site with 83% having no clear preference. However, nearly 73% preferred to dispose of the dredged material on private land (Table III-4-7).

The projected volume of dredged material from future projects was slightly less than the amount dredged during the preceeding period (Table III-4-8). About 22% of the approximately 102,000 yds^3 is related to expansion compared to 67% specified for maintenance. Nearly 55% had not undertaken any qualitative sedimentation test, which reflects a condition very close to that of the state as a whole (Table III-4-9). Mixed sediments contribute the largest group, followed by silt (26%) (Table III-4-10). The urgency to dredge is not as strong as in the previous case studies. Less than 46% indicated a need to dredge more frequently than between 5 - 10 years and none perceived the need so critical as to require dredging at more frequent intervals than once every five years.

Narragansett

The Narragansett respondents are about evenly divided between private and state facilities, the latter including the Port of Gallilee and several boating ramps operated by the Department of Environmental Management (DEM) (Table III-4-1). About half the respondents felt a need to dredge within the ten year planning period (Table III-4-2), with about one quarter indicating no adverse impact as a result of the limited dredging activity during the 1980-1984 period (Table III-4-3). About 30% felt they would not be adversely affected in the event that this trend would continue between 1985-1995. Nearly half (46%), identified a combination of projects principally related to berth and slip dredging and deepening existing channels (Table III-4-4). Those operators (5) who perceived an adverse impact cited servicing smaller boats as the principal coping mechanism should future dredging operations be denied or severely delayed (Table III-4-5). No strong feeling or opinion was expressed relating to the use of former disposal sites/methods (Table III-4-6). More than 3/4 of those responding preferred a disposal site on public land (Table III-4-7).

The relationship between previous and future dredging again is nearly identical and similar to that identified for South Kingstown and categorized as strictly maintenance (Table III-4-8). Only two out of a total of 13 respondents had performed sediment tests (Table III-4-9). Sand and mixed sediments are the predominant sediment types. The perceived frequency again is very similar to that identified for South Kingstown with some 45% of those responding citing a need to dredge within the next ten years (Table III-4-11).

Block Island

Block Island's dredging needs are uniquely associated with tourism and recreational boating. The island is serviced by several ferries and tourboats and several marinas in both the New and Old Harbor. In this regard the island is illustrative of the state's other tourist oriented municipalities (Table III-4-11).

The need to dredge within the planning period is not as severe as in some of the other municipalities (Table III-4-2). One third of the 12 respondents were not adversely affected by the absence of dredging between 1980-1984. Channel dredging was identified as the principal area in need of attention (Table III-4-3). The channel leading into New Harbor has recently been dredged which probably accounts for the changed orientation from channel (past) to berths and slips (projected) (Table III-4-4).

Only three of the 12 Block Island respondents answered the question about future business impacts with no dredging policy. Two respondents mentioned a reduction in the facility's growth potential while one cited the possibility of closure. Similarly, only a few responded to the question related to the preference of utilizing previous disposal sites (Table III-4-6) indicating the limited amount of land and the high preference for disposing of dredged material in the water away from the dredging (Table III-4-7). This selection is followed by public land as the preferred disposal site, with only two respondents preferring a private site.

About 77,000 yds^3 of material is projected for disposal compared to 49,000 yds^3 during the 1980-1984 period (Table III-4-8). Slightly less than 20% is associated with the expansion of existing facilities, with nearly one third identified as maintenance dredging (Table III-4-9). Twenty percent of the respondents had qualitative sediment tests done. Nearly 60% of those responding identified sand as the principal sediment (Table III-4-10). The proportion of respondents mentioning dredging needs within the next ten years has dropped to 50% (Table III-4-11), no doubt reflecting the minimum modification to which the island has been subjected.

North Kingstown

The heavy dependence of recreational activities is evident for North Kingstown as well with somewhat greater emphasis on recreational clubs (27%) as opposed to commercial marinas (40%) (Table III-4-1). Of the 15 respondents two-thirds did not anticipate any need to dredge during the planning period (Table III-4-2). This is reflected in the answers dealing with the immediate past where 40% of the respondents did not experience any adverse impacts as a result of previous dredging activities. Those respondents who indicated an adverse impact were divided evenly between need to dredge around berths and slips and deepening the channels. Slightly more than 13% indicated multiple impacts (Table III-4-4). Future expectations are almost replicating past perceptions. One third of the respondents did not anticipate dredging needs during the next ten years and of those who did, most see a need to deepen channels (20%) and areas surrounding berths and slips (13%) (Table III-4-4). Eight of the respondents did indicate some adverse impacts to their operation. The typical response mechanism would be to emphasize service to smaller boats. Twenty -five percent did mention the prospects of having to close the facility (Table III-4-5). Only two of the respondents had opinions related to the use of past disposal sites, perhaps reflecting the relatively low demand (past and future) for dredging (Table III-4-6). Of the eight who responded to the question dealing with the preferred disposal site, fifty percent would prefer to discharge this material in the water but away from the dredge operation. Only 2 respondents indicated private land as a preferred option (Table III-4-7).

North Kingstown is the community with the largest amount of sediment projected to be moved during the 1985-1995 planning period, nearly all of it associated with the Quonsett-Davisville port facility. Furthermore, of the nearly 1.3 million cubic yards of sediment projected for removal, 96% is related to new projects. It should be noted in this context that Quonsett-Davisville is in the process of being developed as the state's premier commercial port/industrial park. This facility already houses one of the state's largest employers (General Dynamics) whose future expansion may depend upon adequate depth in the approach channels (Table III-4-8).

Only two of the fourteen respondents had undertaken qualitative physical analysis of the sediments (Table III-4-9). Nearly half of the respondents identified mud as the principal sediment type followed by mixed sediment types and sand (Table III-4-10).

The need to dredge within the next ten years was expressed by only one respondent, while 40% indicated a need to dredge at an interval between 10 and 15 years. Finally, another 40% did not expect to dredge within the next 20 years (Table III-4-11).

Jamestown

The rural and suburban character of Jamestown is also reflected in the make-up of the marine related activities on the island. More than half of the respondents (5) identified themselves as marinas, boatyards and recreational clubs with another three projects identified as municipal (Table III-4-1). Jamestown currently services a much larger boating clientele than is currently residing on the island. Two-thirds of the respondents planned to dredge within the next ten years (Table III-4-2). All but two of the respondents felt that their operations had been adversely affected by the limited dredging during the 1980-1984 period (Table III-4-3). Most of these projects (4) were associated with haul-out facilities with another three respondents indicating several projects in need of dredging. Only two respondents (out of 9) indicated no need to dredge (Table III-4-2). This finding was replicated when the respondent was asked to project the future impact of a limited or no dredging policy (Table III-4-4). Two of the six respondents (Table III-4-5) indicated the possibility of having to close the facility in the event of a "no action alternative", while half indicated that a move from large to smaller boats would be necessary. Two-thirds (4) preferred to dispose of dredged material in the water but away from the dredge site (Table III-4-7).

The projected amount of sediment associated with Jamestown operations is comparatively small, less than 11,000 yds^3, nearly all of which is identified as maintenance (Table III-4-8). Nearly two-thirds of the projects have sediment consisting of sand (Table III-4-10) and fifty percent identified a need to dredge within the next ten years (Table III-4-11).

East Greenwich

A total of nine projects were identified in East Greenwich, at least five of which were associated with recreational boating, as compared to commercial shipping and fishing (Table III-4-1). More than 50% (5) of the respondents did not indicate a need to dredge within the next ten years (Table III-4-4), nor had they experienced any adverse impacts through the lack of dredging during the previous five years (Table III-4-3). Half of those who identified a need to dredge during the 1980-1984 period cited shallow depths in channels as the principal problem 'Table III-4-4). All who responded to possible coping mechanisms mentioned moving from servicing large to smaller boats as the preferred way of dealing with such a problem (Table III-4-5). Of the four who responded to where such material should ideally be deposited, two indicated preference for an "in the water but away from project site " Public and private land disposal were each cited by one respondent (Table III-4-7).

The projected amount of sediment to be dredged was slightly less than the amount actually removed during 1980-1984 and all was associated with maintenance projects (Table III-4-8). Two respondents had conducted sediment tests while three were unsure. Four indicated that no such testing had been done (Table III-4-9). Half of the respondents indicated that the sediment consisted of mud, with sand and silt sharing the balance

(Table III-4-10).

Only forty-four percent indicated a need to dredge within the next ten years and none saw a need to undertake such action within the next five years. Three of the respondents were not sure (Table III-4-11).

Warwick

Warwick is the community with the second largest number of projects (36), second only to Newport (Table III-4-1). Nearly half, 47%, indicated a need to dredge during the next ten years (Table III-4-2), although when asked to identify areas affected by the dredging activities during the 1980-1984 period 75% of the respondents identified specific impacts Of these almost 30% related to haul-out facilities followed by areas surrounding berths and slips, while 23% indicated multiple projects (Table III-4-3).

Nearly 28% (10) indicated that they would not be adversely affected in the event of a continuation of a limited dredging policy during the next ten years. Of those projects which would be affected, haul-out and areas around existing berths and slips would be most affected (Table III-4-4).

The preferred coping mechanism cited by about half (47%) would be to move from servicing large to smaller boats. The prospect of closure was cited by fewer than 16%, although ten percent felt that the lack of future dredging would limit growth prospects (Table III-4-5). Only one respondent had undertaken a test of the sediments (Table III-4-6). Private land was seen as the preferred disposal site by 44% followed by public land, which was cited by nearly twenty-eight percent. In the water, but away from the dredge site was mentioned by only 17% (Table III-4-7).

The volume of dredged material associated with the thirty-six projects total 220,000 yds^3, nearly evenly divided between expansion and maintenance (Table III-4-8). Two respondents had had sediment tests done, while three were unsure and four indicated no tests had been done (Table III-4-9). Most of the sediment consists of mud (34%), sand (22%), silt (9%) and gravel (9%) (Table III-4-10).

The frequency of future dreding was almost evenly divided between those requiring dredging within ten years (12) and those with no perceived dredging needs within the next twenty years (11). Seven respondents saw dredging needs between 10 and 20 years (Table III-4-11).

Cranston

Cranston is the last community on the western shore of Narragansett Bay which caters almost exclusively to the needs of the recreational boating public. Furthermore, the number of respondents was only five, three of which are clubs (Table III-4-1). As the tidal effects decrease, the greater the probability of sedimentation. This is especially so at the head of the bay. Eighty percent of the projects included in Cranston will require dredging during the next ten years (Table III-4-2), and only one project was not adversely impacted as a result of no dredging during the 1980-1984 period. Two of the five respondents identified silting problems adjacent to berths and slips, while the balance identified two or more projects in need of dredging (Table III-4-3). The past often appears to be a pattern of the future which seems to be the case for Cranston. Three of the five respondents believed dredging around the berths and slips would be required (Table III-4-4). Only two respondents answered the questions dealing with the impacts to the business in the event that no dredging activities would take place. Both respondents saw closure as the distinct possibility (Table III-4-5).

None of the five Cranston respondents answered the questions dealing with future disposal sites (Table III-4-6). Two of the four respondents prefer disposing of the dredged material in the water away from the dredge site, with public and private land sharing the balance (Table III-4-7).

No dredging activities took place during the 1980-1984 period and only 26,000 yd^3 is identified during the next decade, all of it unspecified with respect to maintenance or expansion (Table III-4-8). Three of the five respondents had undertaken sedimentation test, the highest rate of any of the coastal municipalities included in the survey (Table III-4-9). Forty percent of the respondents (2) were aware of the sediment type. Those were divided between silt and sand (Table III-4-10). Sixty percent (3) believed dredging would be required between 5 and 10 years, with the balance requiring dredging between 15 and 20 years (Table III-4-11).

Providence

Tables III-4-1 through III-4-11 are derived directly from the responses obtained from the questionnaires except that they have been disaggregated by coastal municipalities (Figure III-4-1). Thus, Providence had a total of 18 projects which were port related (Table III-4-1). In addition, one project each was identified that was with a commercial marina, private, federal and municipal operation.

Located at the head of the bay, nearly eighty-two percent of the projects in Providence are related to commercial port activities (Table III-4-1). Six of the 22 projects expect to dredge within the next ten years (Table III-4-2). Seven projects (32%) experienced difficulties around the berths and slips (Table III-4-3) and nearly 60% felt that their operations would be adversely affected in the event that no dredging would take place. Ten of these (46%) are associated with berths and slips (Table III-4-4). Fifty percent would have to close, while another fifty percent would experience limited growth. Only twenty percent (2) of the respondents would move from servicing large to smaller vessels (Table III-4-5). Seventy-five percent (6) preferred to dispose of the dredged material "in the water away from the site" of the dredging activity (Table III-4-7).

Providence is the municipality with the largest projected dredging volume, totalling more than half a million cubic yards (Table III-4-8), nearly all of which is associated with maintenance projects. Four respondents (22%) had undertaken sediment tests (Table III-4-9). Seventy percent of the respondents identified sediments as mud (43%), silt (21%) and sand (7%) (Table III-4-10).

While the need to dredge was considerable, only seven respondents (35%) felt that dredging would be required more frequently than every ten years (Table III-4-11).

East Providence

East Providence is the municipality with the second largest commercial shipping port in Rhode Island. Almost 55% of the eleven respondents identified themselves with the commercial shipping industry. This was followed by commercial marinas (27%), and boat clubs and municipal projects, each identifies with one respondent (Table III-4-1).

About fifty-five percent (6) plan to dredge during the next ten years; the balance (5) indicating no need to dredge within this period (Table III-4-2). When seeking information about past such impacts, five respondents (46%) indicated no adverse impacts with four claiming a need to dredge around berths and slips (Table III-4-3). When assessing future impacts, five respondents (45%) did not expect any adverse impact in the event of a continued limited dredging policy (Table III-4-4). Five of the respondents felt some adverse impacts. These were almost evenly divided among the five alternate coping mechanisms (Table III-4-5). Only two respondents indicated an interest in using the same disposal site as in the past (Table III-4-6). Three (50%) of the six respondents who answered the question about the preferred disposal site indicated private land as the preferred option while the balance preferred water disposals and one respondent opted for a combination of sites (Table III-4-7).

The amount of sediment to be removed from the East Providence projects is almost as large as the amount estimated for Providence. The exception is that more than 99 percent is for expansion projects (Table III-4-8). Nearly half of the respondents had tests done to determine sediment quality (Table III-4-9). Two of the respondents indicated the presence of mud, followed by silt and gravel as the predominant sediments, each accounting for 14%. Nearly 43% reported the presence of combined sediments (Table III-4-10). Only 30% of the respondents indicated a need to dredge within the next ten years (Table III-4-11).

Pawtucket

Pawtucket is one of the coastal municipalities with the fewest past or future dredge projects, having neither commercial activities nor club or private projects (Table III-4-1). One of the two projects identified is associated with the Pawtucket Redevelopment Agency, and the other a commercial marina. Both projects anticipate a need for dredging during the next ten years (Table III-4-2). One of the two projects concern channel dredging (Table III-4-3), while the other indicates multiple projects (Table III-4-4). Both preferred disposal in the water (Table III-4-7). The volume of the sediment totals 35,000 yds^3, all identified as maintenance (Table III-4-8). One of the respondents had a test done on the quality of sediment (Table III-4-9); both projects require dredging within the next ten years (Table III-4-11), with the sediments made up primarily of silt (Table III-4-10).

Barrington

The importance of recreational boating increases toward the south which is reflected in the make-up of the dredging needs of Barrington. Most respondents expect to dredge within the next ten years (Tables III-4-1 & 2). Two of the seven (29%) did not feel any impact as a result of past dredging while another two respondents had experienced silting near berths and slips (Table III-4-3). About forty-three percent did not feel that their operations would be adversely affected in the event of no future dredging (Table III-4-4). Only one responded to possible coping mechanisms (Table III-4-5), and none had any plans to move from disposal sites used in the past (Table III-4-6). Two preferred disposal on private land while two opted for an "in the water away from the dredge site" disposal site (Table III-4-7). About 50,000 cubic yards were projected for removal (Table III-4-8). Two respondents had tests done (Table III-4-9). Mud, sand and gravel were the dominant sediments, accounting for about two-thirds of the projects included in the analysis (Table III-4-10). Less than 30% of the seven respondents indicated a need to dredge within the next ten years. Nearly 43% (3) indicated no dredging need within the next twenty years (Table III-4-11).

Warren

While commercial marinas and boatyards are an important segment of the user community with dredging needs, more than 53% of the projects (7) were private parties (Table III-4-1). Of the 13 projects identified in Warren, nearly 70% indicated a need to dredge within the next ten years (Table III-4-2), reflecting somewhat more expanded expectations about future needs. During the 1980-1984 period, seven out of the total thirteen respondents (54%) indicated some adverse impacts, mostly around berths and slips. The heavily indented shoreline and the relatively more stagnant water appear to aggravate the silting problem in this part of the bay compared to locations farther south (Tables III-4-3 & 4). The expected coping methods are similar to those of the other coastal communities with a significant recreational boating activity. Four of the seven respondents answering this question indicated that their growth potential would be affected while three respondents indicated a change in their operation by moving to servicing smaller boats (Table III-4-5). Only two of the thirteen respondents preferred to use the same disposal site as in the past (Table III-4-6). Two disposal methods/sites were mentioned by the few respondents answering this question (Table III-4-7) with half indicating private land and half preferring sites "in the water away from the dredge site". A total of 15,600 yd^3 of dredge material was projected by the thirteen respondents with 60% associated with expansion (Table III-4-8). One quarter of the twelve respondents had sediment tests made (Table III-4-9), most of which consisted of mud, silt, and sand (54%), (Table III-4-10). Around 36% indicated a need to dredge between five and ten years with no one indicating a need within the next five years (Table III-4-11).

<u>Bristol</u>

Although Bristol is one of the largest and most important boating and boatbuilding/repair communities along the Rhode Island shore, more than 50% of the facilities with dredging needs are operated by the state with another 23% maintained by the municipality. Only two facilities are dirctly associated with either yacht clubs or marinas and boatyards (Table III-4-1). Furthermore, only two plan dredging within the foreseeable future (Table III-4-2). Similarly, only five of the respondents from Bristol had been affected by the limited dredging during the past ten years (Table III-4-3), and only two respondents indicated a potential adverse impact as a result of the limited dredging policy and only three responded to moving from servicing large boats to smaller ones as a potential coping mechanism (Table III-4-4 and 5). Nine of the fifteen respondents answered the question dealing with past and future disposal sites (Table III-4-6), although 3, (75%), indicated a preference for disposing of this material in the water away from the dredging site. (Table III-4-7).

The projected amount was relatively small consisting of only 4500 cubic yards, all related to maintenance projects (Table III-4-8). None of the twelve respondents answering the question concerning the quality of the sediment had tests done (Table III-4-9). More than sixty-two percent (5) indicated that silt was the predominant sediment, with one facility each characterized by sand, gravel, and mixed sediments (Table III-4-10). Only one respondent indicated a need to dredge within the 15-20 year time frame (Table III-4-11).

<u>Portsmouth</u>

Ten marine related activities characterize the Portsmouth waterfront, 70% of which are associated with marinas and boatyards (Table III-4-1). Six of the facilities indicated a future dredging neea, (Table III-4-2), although 50% did not experience any adverse impact to their operations as a result of limited past dredging actvities. Forty percent of those who indicated some adverse effect were related to marina and boatyard operations (Table III-4-3).

Unlike most of the previous coastal facilities, only 30% of the respondents projected no future effects in the event of a continued restricted dredging practice. Ten percent each indicated dredging needs around haul-out, berths and slips (Table III-4-4). Half (3) of the respondents indicated that their operations would suffer in the event of no future dredging, and half indicated a move to smaller vessels (2) and powerboats (1) as possible coping mechanisms (Table III-4-5). Only one intended to use the previously used disposal site (Table III-4-6), and two respondents (33%) noted private land as the preferred site.

Finally, two indicated in water disposal sites, one near the operation and one away from the dredging site (Table III-4-7). Slightly more than 66,000 cubic yards of sediment is projected for removal, 40% of which relates to expansion or new facilities (Table III-4-8). Only one of 10 respondents had tests done on the sediments, which showed mainly mixtures of the primary types (Table III-4-10). About twenty percent indicated a need to dredge within the next 10 years, with forty percent identifying no such need for the next 20 years (Table III-4-11).

Middletown

Only one private respondent was from Middletown (Table III-4-1), who plans to dredge a total of 58,000 cubic yards (Table III-4-8), divided into maintenance and expansion. Some adverse impacts were felt due to silting around berths and slips (Table III-4-3). While no specific impacts could be identified in the event of no future dredging (Table III-4-4), the respondent indicated several coping mechanisms should future dredging be limited (Table III-4-5). No plans were mentioned with respect to the use of previous dredged disposal sites (Table III-4-6). A preference for disposing of future dredged material in the water near the dredge site was expressed (Table III-4-7. No tests have yet been conducted analyzing the quality of the sediment (Table III-4-9), which consists primarily of combined sand, silt, mud, rock and gravel (Table III-4-10). Finally, this operation indicated a need to dredge within a five to ten year period (Table III-4-11).

Newport

In terms of sheer numbers, Newport represents the municipality with the highest number of identified projects, and the community which has changed its waterfronts the most. About one third of the projects are associated with marinas and boatyards, followed by municipal projects and private operations

(Table III-4-1). Slightly more than 36% expect to dredge in the future (Table III-4-2). Two thirds (26) had not experienced any adverse impacts due to limited previous dredging activities. Of the 11 respondents who encountered some impacts six (15%) were related to dredging needs near berths and slips, two (5%) had encountered difficulties with channels, and five (13%) had felt they had been adversely impacted (Table III-4-3).

The immediate past appears indicative of the future as far as projected needs and impacts are concerned. Nearly 62% (24) of the respondents did not anticipate any impacts with no future dredging. About 20% (8) expect difficulties with operation of berths and slips in the event of no future dredging. Relatively few, 3, expect problems with channels. Of the eleven (Table III-4-5) who responded to the question dealing with specific coping mechanisms in the event of the implementation of a limited dredging policy, forty-six percent (5) suggested they would move from servicing larger to smaller boats, while the balance (6) were evenly divided among the options of closing, multiple impacts and limited growth. Only one of the respondents expected to use the same disposal site (Table III-4-6), and the vast majority (71%) opted for disposing of future dredged material in the water away from the dredge site (Table III-4-7).

As discussed above, Newport is the one community which has experienced the greatest amount of shoreline modification during the past ten years, a process which is continuing almost unabated. It is not surprising therefore, that of the 378,000 cubic yards of sediment projected for removal within the next ten years, that 97% is related to expansion (Table III-4-8). Eight of the respondents (21%) had quality tests made on the sediments (Table III-4-9), which consisted predominately of mud (52%), followed by small amounts of silt (8%), sand (8%) and rock (10%) (Table III-4-10). Only nine of the thirty-seven Newport respondents anticipated dredging within the next ten years and only four of those expect need to dredge within the next 5 years (Table III-4-11).

Tiverton

Tiverton, located at the confluence of Mount Hope Bay and the head of the Sakonnet River, has twelve facilities with potential dredging needs, one third of which are classified municipal. Nearly seventeen percent each is associated with commercial ports and commercial marinas and boatyards (Table III-4-1).

Tiverton is characterized by strong tidal currents which may relate to the relatively small demand for future dredging within this municipality. Only two respondents indicated a need to dredge (Table III-4-2) and two-thirds (8), indicated no adverse impact as a result of limited dredging activity between 1980-1984 (Table III-4-3). Three respondents indicated future dredging needs around berths and slips and only one expected problems with existing mooring areas (Table

III-4-4). Again the immediate past appears to be an indicator of the future. Sixty-seven percent do not anticipate any adverse impacts as a result of no future dredging while three operators expect problems with areas around berths and slips, and one with mooring areas. Only three responded to the question of possible coping mechanisms and all would move from servicing large to smaller boats (Table III-4-5). Only one indicated interest in using previously used disposal sites. Of these, two respondents preferred disposing of the material in the water away from the dredge site while one preferred a private land site (Table III-4-7).

The amount of dredged material totals 35,000 yd^3, all related to maintenance projects (Table III-4-8), and only one had quality tests made of the sediment (Table III-4-9). Nearly half of the respondents (5) indicated that mud was the dominant sediment type, followed by sand (2), and silt (2), with two respondents indicating mixed sediments. Twenty-five percent indicated a need to dredge between 5 and 10 years, the rest (9), indicated needs beyond the present planning period, 1985-1995 (Table III-4-11).

Little Compton

Five projects characterize the Little Compton waterfront, two of which are associated with commercial marinas and boatyards, the remainder are associated with boat clubs, state facilities and a private project (Table III-4-1). Two of the five plan to dredge in the future (Table III-4-2), but only one respondent had not been adversely affected by past dredging activities. Of the four who claimed to have been affected, berths/slips, channels, and haul-out were each identified by one respondent. The last was identified with more than one type of impact (Table III-4-3).

In the event of no future dredging activities, two of the five felt that problems would occur around berths and slips, while one expected to have problems with haul-out facilities (Table III-4-4). Only one operator responded to coping mechanisms in the event of no future dredging, with the preferred action being one of moving from servicing large to smaller boats (Table III-4-5). None of the five respondents intended to use previous disposal sites (Table III-4-6), and the two who responded preferred to dispose of any dredged material on private land (Table III-4-7). Of the 7200 yd^3 of sediment projected for removal, 2200 yd^3 (30%) is associated with maintenance projects (Table III-4-8). Two respondents had tests conducted on the sediment (Table III-4-9) which consisted mainly of mixed material (60%) and sand (40%) (Table III-4-10. None of the five respondents indicated a need to dredge within the next ten years (Table III-4-11).

4.1.2. Cluster Analysis - Rhode Island

This chapter clusters the project volumes by location irrespective of the township in which the projects are located. A total of forty-nine project clusters have been identified. The analysis is divided into two parts: a cartographic presentation identifying the clusters in addition to the volume of sediments of past projects and the amounts of dredged material projected for removal during the 1985-1995 planning period. Future amounts are also divided into those associated largely with new and/or expansion of existing projects. This map appears as Figure III-4-1.

The second part of the cluster analysis consists of a brief written description of the cartographic representation emphasizing the volume of the material projected to be dredged within the next decade. This data is presented by township for Rhode Island.

The forty-nine clusters have been broken down into six groups based on the volume of material to be dredged. The smallest group, consisting of four clusters (Table III-4-12), accounts for 76% of the total volume projected to be dredged within the next ten years, divided into 12 projects. All but one of the clusters are located in the mid to upper portion of the bay, Coasters Harbor which includes the proposed Rose Island Marina in Newport being the exception with sediment loads somewhat lower than the remaining three. Nearly 80% of the total volume, 2.2 million yd^3, is associated with expansion projects and more than half identified with one project (Quonset-Davisville). In fact, all of the dredging projected for these areas is related to expansion of new projects. Only the respondents included in the Municipal Dock cluster in Providence have designated all of their dredging as maintenance.

The second group is made up of fourteen clusters, representing a total of 62 projects. In the cartographic representation these volumes were divided evenly between the two categories while Table III-4-12 only included the actual volumes reported for new projects/expansion and maintenance. This cluster accounts for about 21% of the total projected dredged material (741,000 yd^3). Twenty-eight percent (210,000 yd^3) is associated with new or expansion of existing projects, while sixty-two percent is maintenance related. It will be noted that the projected material associated with expansion and maintenance may not total 100%. Several respondents were not able to identify whether the project belonged to one or the other category. The fourteen clusters range from 26,100 yd^3 in the case of Riverside to more than 90,000 yd^3 for Greenwich Bay.

No clear geographical distribution is apparent in this group. Two of the clusters are located outside of Narragansett Bay (New Harbor, Snug Harbor, Upper Pond, Watch Hill and Sakonnet). Several are located in decidedly suburban locations where they appear to be servicing a growing demand for slip and mooring sites from the more urban locations.

Only three of the clusters identify most of their

Figure III-4-1

RHODE ISLAND DREDGING VOLUME

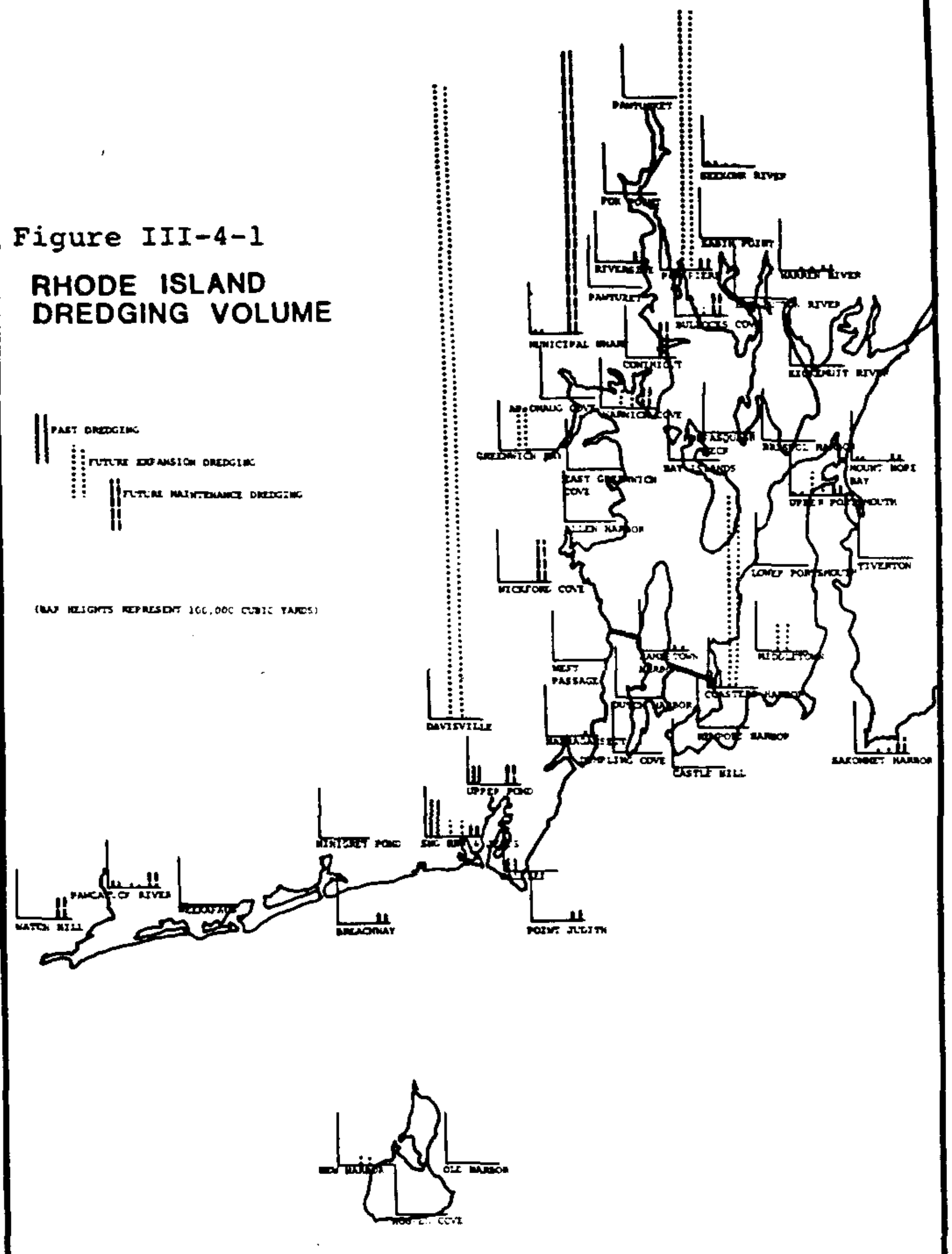

Table III-4-12. Projected Dredge Volume By Clusters in Rhode Island: In Thousands Cu Yds (1985-1995)

	Total Volume		Expansion		Maintenance	
	Vol	# Proj.	cu yds	%	cu yds	%
Quonsett-Davisville	1,250.0	(1)	1,250.0	100.0		
Municipal Dock	535.0	(6)			535.0	100.0
Providence	512.5	(2)	500.0	97.6	12.5	2.4
Coasters Harbor	426.6	(3)	420.5	98.7	6.1	1.4
	2,724.1		2,170.5	79.7	553.6	20.3
Greenwich Bay	90.5	(4)	80.0	88.4	10.5	11.6
Warwick	81.6*	(10)	30.2	37.0	38.4	47.1
Wickford	78.0	(7)			78.0	100.0
New Harbor	77.0*	(4)	15.5	20.1	26.5	34.4
Upper Portsmouth	60.0	(4)	41.5	69.2	18.5	30.3
Middletown	58.0	(1)	50.0	86.0	8.0	14.0
Snug Harbor	50.5	(8)	25.0	50.0	25.3	50.0
Bullocks Cove	50.2	(2)	10.0	19.9	40.2	80.3
Upper Pond	45.9	(5)	1.5	3.3	44.4	96.7
Pawcatuck	41.9*	(7)	3.0	49.7	21.9	52.3
Watch Hill	37.7	(3)			37.	99.5
Conimicut/Pawtuckett	70.2*	(3)			75.2	100.0
Sakonnet	32.2	(2)	4.0	12.4	28.2	87.8
Riverside	26.1	(3)			26.1	83.4
	799.8		260.1	28.4	473.8	62.7
Point Judith	20.0	(1)			20.0	100.0
Charlestown	15.0	(1)			15.0	100.0
Apponaug	13.5	(2)			13.5	100.0
Warren River	10.1	(7)	4.9	43.8	5.2	46.4
Mount Hope Bay	10.0	(1)			10.0	100.0
	68.6		4.9	7.1	63.7	92.9

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Table III-4-12(cont)	Total Volume		Expansion		Maintenance	
	Vol	# of Proj.	cu yds	%	cu yds	%
Narragansett	6.8	(1)			6.8	100.0
Lower Portsmouth	6.5	(1)	6.5	100.0		
Jamestown Harbor	6.3	(2)			6.3	100.0
Newport	6.2	(7)			6.2	100.0
Fox Point	5.2				5.2	100.0
Seekonk	5.0		2.5	50.0	2.5	50.0
Kickemuit	4.5		4.5	100.0		
Bristol	4.5				4.5	100.0
Castle Hill	4.0				4.0	100.0
Greenwich Cove	3.1				3.1	100.0
Dutch Harbor	2.8		.8	19.6	2.0	80.4
Weekapaug	2.4*				1.6	66.6
	56.3		13.5	23.9	37.1	65.8
Dumplings	1.1		.3	27.3	.8	72.7
Sabin Point	.9				.9	100.0
Gallilee	.7				.7	100.0
Hog Pen	.7		.7	100.0		
Barrington River	.6				.6	100.0
Pawtucket	.13		.08	61.5	.05	38.5
Ningret	.05			50.0	.05	50.0
	4.18		1.08	25.8	3.10	74.2

SAIC

dredging needs in the expansion and new project category (Greenwich Bay, Upper Portsmouth, and Snug Harbor) all of which are located well within the suburban fringe discussed above.

Although all fourteen clusters identify some need to have maintenance dredging done within the next ten years nine claim all or most of their dredging as maintenance. Furthermore, most of those are located in areas where tides, especially ebb tides, may be less active compared to flood tides thus aggravating sedimentation. These sites include Wickford, Bullocks Cove, Upper Pond, Watch Hill, Conimicut, Pawtucket, Sakonnet and Riverside.

The third group consists of five clusters, comprising 12 projects with projected dredging needs ranging from 10,000 yd^3 (Mt. Hope Bay) to 20,000 yd^3 (Pt. Judith). All but one of the five clusters designated their projected needs in the maintenance category. All are located in the urbanized portion of the state.

The fourth group consists of twelve clusters which account for a total of 56,000 yd^3, 16.6% of the sediment projected for removal during the next ten years. Twenty-eight projects are included in this category. About 26%, 13,500 yd^3 is associated with expansion, with the balance, 37,000 yd^3, or 66% projected as maintenance. The amount of sediment identified for removal ranges from 2,400 yd^3 in the case of Weekapaug to 6,800 yd^3 for Narragansett.

Although the average dredged amount designated for expansion and new projects is 24%, eight of the clusters have no plans to expand. Furthermore, most of these, Narragansett, Jamestown Harbor, Newport, Castle Hill, Dutch Harbor and Weekapaug, are located in the southern part of the state, away from the major center of demand with a presumed reduced incentive to expand or to create new facilities.

The fifth group consists of seven clusters and eleven projects with identified dredging needs totalling 4,150 yd^3. This accounts for a mere .1% of the total identified projected Rhode Island dredging needs for the 1985-1995 planning period.

The amount of dredged material is, by comparison to the previous groups, small, although no less important for the individual marinas, boatyards, ramps or private project. They vary in size from 50 yd^3 for Ninigret to about 1,100 yd^3 for the Dumplings.

Only two projects (Dumplings and Pawtucket) have identified needs for new and/or expansion projects totalling 370 yd^3.

The last group, consisting of seven clusters, has no projected need for dredging. No apparent geographical or locational characteristics appear to summarize these centers. One of the contributing factors to the absence of dredged material associated with this group, is that there are relatively few facilities associated with these clusters.

4.2 Southeastern Massachusetts

The same questionaire was used for acquisition of information in Massachusetts, and tabulated data based on responses from the questionaire and listed by township are presented in Tables III-4-13 through III-4-22.

The purpose of this section is to outline, geographically, the amount of dredged material that is planned for removal in Southeastern Massachusetts. For purposes of clarity, the Southeastern Massachusetts region covered in this survey has been broken down into six areas as shown in Figure III-4-2.

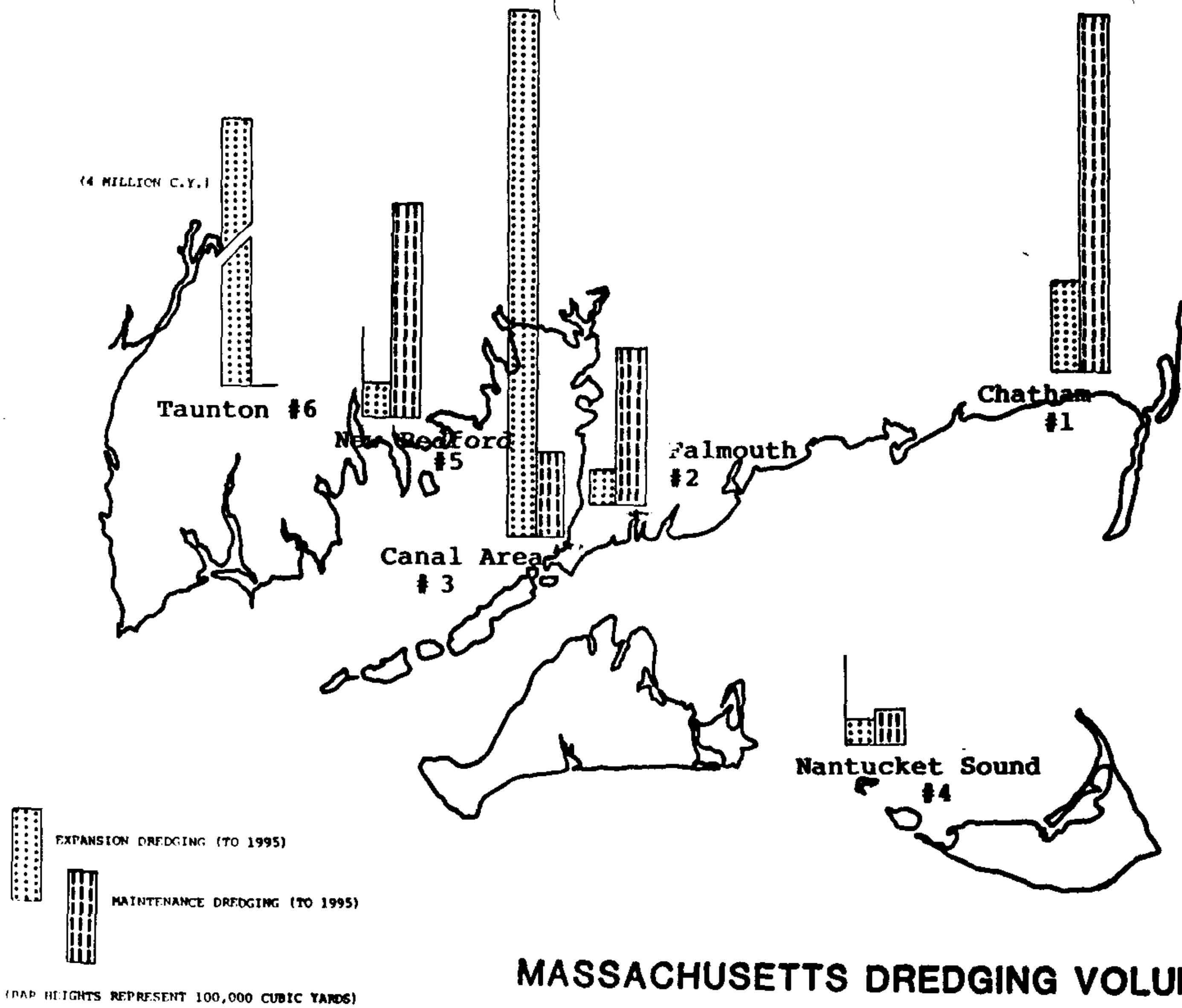
4.2.1 Geographical Areas

Area 1 extends from Chatham in the east to Barnstable in the northwest. This area includes the municipalities of Chatham, Harwich, Dennis, South Dennis, West Dennis, South Yarmouth, Hyannis and Barnstable. In this area can be found numerous commercial marinas and boatyards serving the Cape Cod tourist industry. Also, the towns mentioned above repair and maintain several channels, ramps and municipal docks in the waterways and rivers in their jurisdiction.

Area 2 extends from Woods Hole in the southwest corner of Cape Cod to Cataumet several miles to the northeast. This area includes the towns of Woods Hole, Falmouth, North Falmouth, East Falmouth, West Falmouth, Mashpee and Cataumet. This area also includes many marinas and yacht clubs as well as the continually developing high technology oceanographic industry surrounding Woods Hole and Falmouth.

Area 3 covers the mid-Cape as well as the northwestern portion which extends to the Cape Cod Canal at Sandwich. This area includes the townships of Marstons Mills, Osterville, East Sandwich, Contuit, Bourne, Buzzards Bay and Onset, as well as the canal itself. This area is especially rich in coastal and estuary facilities, specifically in the Osterville, Oyster Harbor area which caters to recreational as well as commercial boaters. In addition, this area includes the Cape Cod Canal, which is maintained and operated by the U.S. Army Corps of Engineers and could be the approximate site of several federally planned and sponsored dredging operations.

Area 4 includes the three major island groups located to the south of Cape Cod in Nantucket Sound and Buzzards Bay. These islands include the tourist meccas of Martha's Vineyard and Nantucket as well as the Elizabethan Islands of Cuttyhunk, Nashawena and Naushon. The towns which are on these islands include: Vineyard Haven, Chilmark, Oak Bluffs, Edgartown and



MASSACHUSETTS DREDGING VOLUME

Figure III-4-2

TABLE III-4-13

F[illegible]LITY TYPE

Townships	Ports Terminals		Yacht Clubs		Commeri[illegible] Marinas		State		Municipal		Private		Federal		Wholesale Fish	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Barnstable	0	0	0	0	1	50.0	0	0	1	50	0	0	0	0	0	0
Bourne	0	0	1	33.3	0	0	0	0	0	0	0	0	2	66.7	0	0
Buzz.Bay	0	0	0	0	5	83.3	1	16.7	0	0	0	0	0	0	0	0
Cape Cod Canal	0	0	0	0	0	0	0	0	0	0	0	0	0	100.0	0	0
Cataumet	0	0	0	0	2	100.0	0	0	0	0	0	0	0	0	0	0
Chatham	0	0	0	0	3	50.0	0	0	1	16.7	1	16.7	1	16.7	0	0
Chilmark	0	0	0	0	1	100.0	0	0	0	0	0	0	0	0	0	0
Cotuit	0	0	0	0	0	0	0	0	0	0	2	100.0	0	0	0	0
Cuttyhunk	0	0	0	0	0	0	0	0	1	100.0	0	0	0	0	0	0
Dartmouth	0	0	0	0	0	0	0	0	1	50.0	1	50.0	0	0	0	0
Dennis	0	0	0	0	1	33.3	0	0	1	33.3	1	33.3	0	0	0	0
Dighton	0	0	0	0	2	66.7	0	0	1	33.3	0	0	0	0	0	0
E. Falmouth	0	0	1	50.0	1	50.0	0	0	0	0	0	0	0	0	0	0
E. Sandwich	0	0	0	0	0	0	0	0	0	0	1	100.0	0	0	0	0
Edgartown	0	0	1	20.0	4	80.0	0	0	0	0	0	0	0	0	0	0
Fairhaven	0	0	0	0	4	66.7	0	0	1	16.7	0	0	0	0	1	16.7
Fall River	0	0	0	0	1	33.3	0	0	0	0	1	33.3	1	33.3	0	0
Harwich	0	0	0	0	1	20.0	0	0	2	40.0	1	20.0	1	20.0	0	0
Hyannis	0	0	1	10.0	5	50.0	0	0	0	0	3	30.0	1	10.0	0	0
Marion	0	0	0	0	2	66.7	0	0	0	0	1	33.3	0	0	0	0
Marstons Mills	0	0	0	0	1	100.0	0	0	0	0	0	0	0	0	0	0

TABLE III-4-13 (cont)

Townships	Ports Terminals		Yacht Clubs		Commerical Marinas		State		Municipal		Private		Federal		Wholesale Fish	
Mashpee	0	0	0	0	2	50.0	0	0	2	50.0	0	0	0	0	0	0
Mattapoisett	0	0	0	0	2	66.7	0	0	0	0	1	33.3	0	0	0	0
Menemsha	0	0	0	0	0	0	0	0	2	66.7	0	0	1	33.3	0	0
Nantucket	0	0	0	0	5	83.3	0	0	0	0	0	0	1	16.7	0	0
New Bedford	0	0	0	0	1	16.7	0	0	0	0	2	33.3	0	0	3	50.0
N. Falmouth	0	0	0	0	0	0	0	0	0	0	1	100.0	0	0	0	0
Oak Bluffs	0	0	0	0	0	0	0	0	1	100.0	0	0	0	0	0	0
Onset	0	0	1	33.3	2	66.7	0	0	0	0	0	0	0	0	0	0
Osterville	0	0	1	11.1	2	22.2	0	0	0	0	6	66.7	0	0	0	0
Somerset	2	40.0	0	0	2	40.0	0	0	1	20.0	0	0	0	0	0	0
S. Dartmouth	0	0	1	20.0	3	60.0	0	0	0	0	1	20.0	0	0	0	0
S. Dennis	0	0	0	0	1	100.0	0	0	0	0	0	0	0	0	0	0
S. Yarmouth	0	0	0	0	1	50.0	0	0	0	0	1	50.0	0	0	0	0
Swansea	0	0	0	0	1	100.0	0	0	0	0	0	0	0	0	0	0
Vineyard Haven	1	16.7	0	0	5	83.3	0	0	0	0	0	0	0	0	0	0
Wareham	0	0	0	0	2	66.7	0	0	1	33.3	0	0	0	0	0	0
Waquoit	0	0	0	0	0	0	0	0	0	0	1	100.0	0	0	0	0
W. Dennis	0	0	0	0	2	100.0	0	0	0	0	0	0	0	0	0	0
West Falmouth	0	0	0	0	0	0	0	0	1	100.0	0	0	0	0	0	0
Westport	0	0	0	0	2	50.0	0	0	1	25.0	1	25.0	0	0	0	0
Woods Hole	0	0	1	25.0	0	0	0	0	0	0	1	25.0	1	25.0	0	0

TABLE III-4-1 (cont)

	Ports Terminals		Yacht Clubs		Commerical Marinas		State		Municipal		Private		Federal		Wholesale Fish		
Falmouth	0	0	1	7.1	8	57.1	0	0	1	7.1	4	28.6	0	0	0	0	0
TOTAL	3	2.0	9	5.9	76	50.0	1	.6	19	12.4	31	20.3	10	6.5	4	2.6	

TABLE III-4-14. MA - Future Dredging Plans

	Plan to Dredge		No Plans Dredge		Unsure	
	#	%	#	%	#	%
Barnstable	2	100.0	0	0	0	0
Bourne	3	100.0	0	0	0	0
Buzz. Bay	3	50.0	3	50.0	0	0
Cape Cod Canal	1	100.0	0	0	0	0
Cataumet	1	50.0	0	0	1	50.0
Chatham	5	83.3	1	16.7	0	0
Chilmark	0	0	1	100.0	0	0
Cotuit	1	50.0	1	50.0	0	0
Cuttyhunk	1	100.0	0	0	0	0
artmouth	2	100.0	0	0	0	0
Dennis	2	66.7	1	33.3	0	0
Dighton	1	33.3	2	66.7	0	0
E. Falmouth	1	33.3	1	33.3	1	33.3
[illegible]dwich	0	0	1	100.0	0	0
Edgartown	1	20.0	4	80.0	0	0
Fairhaven	3	50.0	3	50.0	0	0
Fall River	1	33.3	2	66.7	0	0
Harwich	4	80.0	1	20.0	0	0
Hyannis	7	70.0	2	20.0	1	10.0
Marion	3	100.0	0	0	0	0
Marstons Mills	0	0	1	100.0	0	0
Mashpee	4	100.0	0	0	0	0
Mattapoisett	3	100.0	0	0	0	0
Menemsha	3	100.0	0	0	0	0
Nantucket	4	66.7	2	33.3	0	0
New Bedford	4	57.1	3	42.9	0	0
W. Falmouth	1	100.0	0	0	0	0
Oak Bluffs	1	50.0	0	0	1	50.0
Onset	2	66.7	1	33.3	0	0

TABLE III-4-14 (cont)

	Plan to Dredge		No Plans Dredge		Unsure	
	#	%	#	%	#	%
Osterville	7	77.8	2	22.2	0	0
Somerset	4	80.0	1	20.0	0	0
S. Dartmouth	4	80.0	1	20.0	0	0
S. Dennis	0	0	1	100.0	0	0
S. Yarmouth	1	50.0	1	50.0	0	0
Swansea	0	0	1	100.0	0	0
Vineyard Haven	4	66.7	2	33.3	0	0
Wareham	2	66.7	1	33.3	0	0
Waquoit	1	100.0	0	0	0	0
W. Dennis	1	50.0	1	50.0	0	0
W. Falmouth	0	0	1	100.0	0	0

Table III-4-15. MA - How Has Your Operation Been Affected By No Dredging

	No Effect		Berth Slips		Moorings		Channels		Haul-out		Multiple Impacts	
	#	%	#	%	#	%	#	%	#	%	#	%
Barnstable	0	0	0	0	0	0	0	0	0	0	2	100
Bourne	0	0	0	0	0	0	0	0	0	0	2	100
Buzz. Bay	0	0	1	25.0	0	0	1	25.0	0	0	2	50.0
Cape Cod Canal	0	0	0	0	0	0	0	0	0	0	0	0
Cataumet	0	0	0	0	1	50.0	1	50.0	0	0	0	0
Chatham	0	0	2	50.0	0	0	1	25.0	1	25.0	0	0
Chilmark	0	0	0	0	0	0	0	0	0	0	1	100
Cotuit	0	0	1	100.0	0	0	0	0	0	0	0	0
Cuttyhunk	0	0	0	0	0	0	1	100.0	0	0	0	0
Dartmouth	0	0	1	50.0	0	0	0	0	0	0	1	50.0
Dennis	0	0	0	0	1	50.0	0	0	0	0	1	50.0
Dighton	1	50.0	0	0	0	0	0	0	0	0	1	50.0
E. Falmouth	0	0	0	0	0	0	0	0	0	0	1	100
E. Sandwich	0	0	0	0	0	0	0	0	0	0	1	100
Edgartown	2	66.7	1	33.3	0	0	0	0	0	0	0	0
Fairhaven	0	0	1	33.3	0	0	0	0	1	33.3	1	33.3
Fall River	0	0	1	50.0	0	0	1	50.0	0	0	0	0
Harwich	0	0	1	33.3	0	0	1	33.3	0	0	1	33.3
Hyannis	1	14.3	5	71.4	0	0	1	14.3	0	0	0	0
Marion	0	0	2	66.7	0	0	0	0	0	0	1	33.3
Marstons Mills	0	0	0	0	0	0	0	0	0	0	0	0
Mashpee	0	0	1	25.0	0	0	2	50.0	0	0	1	25.0
Mattapoisett	0	0	1	33.3	0	0	1	33.3	0	0	1	33.3
Menemsha	0	0	1	50.0	0	0	0	0	0	0	1	50.0
Nantucket	0	0	2	50.0	0	0	2	50.0	0	0	0	0
New Bedford	1	20.0	2	40.0	0	0	1	20.0	0	0	1	20.0
N. Falmouth	0	0	1	100.0	0	0	0	0	0	0	0	0
Oak Bluffs	1	100.0	0	0	0	0	0	0	0	0	0	0
Onset	0	0	1	50.0	0	0	0	0	0	0	1	50.0
Osterville	1	14.3	1	14.3	0	0	0	0	0	0	5	71.4
Somerset	0	0	1	25.0	0	0	1	25.0	0	0	2	50.0

Table III-4-15. Cont.

	No Effect		Berth Slips		Moorings		Channels		Haul-out		Multiple Impacts	
	#	%	#	%	#	%	#	%	#	%	#	%
S. Dartmouth	0	0	1	25.0	0	0	0	0	1	25.0	2	85.0
S. Dennis	0	0	0	0	0	0	0	0	0	0	0	0
S. Yarmouth	0	0	0	0	0	0	0	0	0	0	1	100
Swansea	0	0	0	0	0	0	0	0	0	0	0	0
Vineyard Haven	0	0	0	0	0	0	1	25.0	2	50.0	1	25.0
Wareham	0	0	1	50.0	0	0	0	0	1	50.0	0	0
Waquoit	0	0	0	0	0	0	0	0	0	0	1	100
W. Dennis	0	0	0	0	1	100.0	0	0	0	0	0	0
W. Falmouth	0	0	0	0	0	0	0	0	0	0	0	0
Westport	0	0	1	50.0	0	0	0	0	0	0	1	50.0
Woods Hole	1	100.0	0	0	0	0	0	0	0	0	0	0
Falmouth	2	22.2	2	22.2	0	0	2	22.2	1	11.1	2	22.2

Table III-4-16. MA- Type of Ope ion Function That Will Be Affect If No Dredging Takes Plac During The Period 1985-1995?

	No Effect		Berths & Slips		Moorings		Channels		Haul-out		Multiple Impacts	
	#	%	#	%	#	%	#	%	#	%	#	%
Barnstable	0	0	0	0	0	0	0	0	0	0	0	0
Bourne	0	0	0	0	0	0	0	0	0	0	0	0
Buzz. Bay	1	25.0	2	50.0	0	0	1	25.0	0	0	0	0
Cape Cod Canal	0	0	0	0	0	0	0	0	0	0	0	0
Catamuet	0	0	0	0	0	0	0	0	0	0	0	0
Chatham	0	0	0	0	1	50.0	1	50.0	0	0	0	0
Chilmark	0	0	0	0	0	0	0	0	0	0	0	0
Cotuit	1	50.0	1	50.0	0	0	0	0	0	0	0	0
Cuttyhunk	0	0	0	0	0	0	1	100.0	0	0	0	0
Dartmouth	0	0	1	100.0	0	0	0	0	0	0	0	0
Dennis	0	0	0	0	1	33.3	0	0	1	33.3	1	33.3
Dighton	2	100.0	0	0	0	0	0	0	0	0	0	0
E. Falmouth	1	100.0	0	0	0	0	0	0	0	0	0	0
E. Sandwich	0	0	0	0	0	0	0	0	0	0	1	100.0
Edgartown	1	50.0	1	50.0	0	0	0	0	0	0	0	0
Fairhaven	1	20.0	1	20.0	1	20.0	0	0	1	20.0	1	20.0
Fall River	1	33.3	1	33.3	0	0	1	33.3	0	0	0	0
Harwich	0	0	1	33.3	0	0	1	33.3	1	33.3	0	0
Hyannis	1	20.0	3	60.0	1	20.0	0	0	0	0	0	0
Marion	0	0	2	100.0	0	0	0	0	0	0	0	0
Marstons Mills	0	0	1	100.0	0	0	0	0	0	0	0	0

Table III-4-16. Cont.

	No Effect		Berths & Slips		Moorigns		Channels		Haul-out		Multiple Impacts	
	#	%	#	%	#	%	#	%	#	%	#	%
Mashpee	0	0	1	25.0	0	0	2	50.0	0	0	0	25.0
Mattapoisett	0	0	1	100.0	0	0	0	0	0	0	0	0
Menemsha	0	0	0	0	0	0	0	0	0	0	0	0
Nantucket	1	25.0	2	50.0	0	0	1	25.0	0	0	0	0
New Bedford	1	20.0	2	40.0	0	0	1	20.0	1	20.0	0	0
N. Falmouth	0	0	1	100.0	0	0	0	0	0	0	0	0
Oak Bluffs	0	0	0	0	0	0	1	100.0	0	0	0	0
Onset	0	0	2	100.0	0	0	0	0	0	0	0	0
Osterville	2	100.0	0	0	0	0	0	0	0	0	0	0
Somerset	1	25.0	1	25.0	0	0	1	25.0	0	0	1	25.0
S. Dartmouth	1	25.0	1	25.0	0	0	0	0	1	25.0	1	25.0
S. Dennis	1	100.0	0	0	0	0	0	0	0	0	0	0
S Yarmouth	1	100.0	0	0	0	0	0	0	0	0	0	0
Swansea	0	0	1	100.0	0	0	0	0	0	0	0	0
Vineyard Haven	2	40.0	0	0	0	0	0	0	2	40.0	1	20.0
Wareham	0	0	1	33.3	0	0	0	0	1	33.3	1	33.3
Waquoit	0	0	0	0	0	0	0	0	0	0	0	0
W. Dennis	0	0	0	0	1	100.0	0	0	0	0	0	0
W. Falmouth	1	100.0	0	0	0	0	0	0	0	0	0	0
Westport	1	25.0	2	50.0	0	0	0	0	0	0	1	25.0
Woods Hole	3	100.0	0	0	0	0	0	0	0	0	0	0

Table III-4-16.(nt

	No Effect		Berths & Slips		M[illegible]rings		Channels		Haul-out		Multiple Impacts	
	#	%	#	%	#	%	#	%	#	%	#	%
almouth	4	44.4	2	22.2	0	0	1	11.1	1	11.1	1	11.1
OTAL	28	30.1	31	33.3	5	5.4	10	10.7	9	9.7	10	10.7

Table III-4-17. MA - Do You Plan To Use The Same Disposal Site That Was Used Before?

	Yes		No		Unsure		No Response	
Barnstable	0	0	0	0	0	0	2	100.0
Bourne	0	0	0	0	0	0	3	100.0
Buzz Bay	0	0	0	0	0	0	6	100.0
Cape Code Canal	0	0	0	0	0	0	1	100.0
Cataumet	0	0	0	0	0	0	2	100.0
Chatham	0	0	1	16.7	1	16.7	4	66.7
Chilmark	1	100.0	0	0	0	0	0	0
Cotuit	0	0	0	0	1	50.0	1	50.0
Cuttyhunk	0	0	0	0	0	0	1	100.0
Dartmouth	0	0	0	0	0	0	2	100.0
Dennis	0	0	0	0	1	33.3	2	66.7
Dighton	0	0	0	0	0	0	3	100.0
E. Falmouth	0	0	0	0	1	33.3	2	66.7
E. Sandwich	1	100.0	0	0	0	0	0	0
Edgartown	0	0	0	0	1	20.0	4	80.0
Fairhaven	2	33.3	0	0	0	0	4	66.7
Fall River	0	0	0	0	0	0	3	100.0
Harwich	0	0	0	0	0	0	5	100.0
Hyannis	2	20.0	1	10.0	0	0	7	70.0
Marion	1	33.3	0	0	0	0	2	66.7
Marstons Mills	0	0	0	0	0	0	1	100.0
Mashpee	1	25.0	0	0	0	0	3	75.0
Mattapoisett	1	33.3	0	0	0	0	2	66.7
Menemsha	1	33.3	0	0	0	0	2	66.7
Nantuckett	0	0	0	0	0	0	6	100.0
New Bedford	0	0	0	0	0	0	7	100.0
N. Falmouth	0	0	0	0	0	0	1	100.0
Oak Bluffs	0	0	0	0	0	0	2	100.0
Onset	1	33.3	0	0	0	0	2	66.7
Os ville	3	33.3	0	0	2	22.2	4	44.4
Somerset	0	0	1	20.0	0	0	4	80.0

Table III-4-17. Cont.

	Yes		No		Unsure		No Response	
S. Dartmouth	2	40.0	0	0	0	0	3	60.0
S. Dennis	0	0	0	0	0	0	1	100.0
S. Yarmouth	0	0	0	0	1	50.0	1	50.0
Swansea	0	0	0	0	0	0	1	100.0
Vineyard Haven	2	33.3	0	0	0	0	4	66.7
Wareham	0	0	0	0	0	0	3	100.0
Waquoit	0	0	0	0	0	0	1	100.0
W. Dennis	1	50.0	0	0	0	0	1	50.0
W. Falmouth	0	0	0	0	0	0	1	100.0
Westport	0	0	0	0	0	0	4	100.0
Woods Hole	0	0	0	0	0	0	4	100.0
Falmouth	2	13.3	0	0	0	0	13	86.7
TOTAL	21	13.5	3	1.9	8	5.1	124	79.5

Table III-4-18. MA - How Do You Plan To Dispose Of The Sediment?

	Public Land		Private Land		In Water Near		In Water Away		Combined	
	#	%	#	%	#	%	#	%	#	%
Barnstable	0	0	0	0	1	100	0	0	0	0
Bourne	0	0	0	0	0	0	1	100	0	0
Buzz. Bay	0	0	0	0	1	50.0	1	50.0	0	0
Cape Cod Canal	0	0	0	0	0	0	1	100	0	0
Cataumet	0	0	0	0	0	0	0	0	1	100
Chatham	4	100	0	0	0	0	0	0	0	0
Chilmark	0	0	0	0	1	100	0	0	0	0
Cotuit	0	0	0	0	0	0	0	0	0	0
Cuttyhunk	0	0	0	0	0	0	0	0	0	0
Dartmouth	1	100	0	0	0	0	0	0	0	0
Dennis	1	100	0	0	0	0	0	0	0	0
Dighton	0	0	1	100	0	0	0	0	0	0
E. Falmouth	1	100	0	0	0	0	0	0	0	0
E andwich	0	0	0	0	0	0	0	0	0	0
Edgartown	0	0	0	0	0	0	0	0	0	0
Fairhaven	0	0	1	33.3	1	33.3	0	0	1	33.3
Fall River	0	0	0	0	0	0	1	100	0	0
Harwich	3	100	0	0	0	0	0	0	0	0
Hyannis	1	16.7	2	33.3	1	16.7	1	16.7	1	16.7
Marion	2	66.7	0	0	0	0	0	0	1	33.3
Marstons Mills	0	0	0	0	0	0	0	0	0	0

Table III-4-18. Cont.

	Public Land		Private Land		In Water Near		In Water Away		Combined	
	#	%	#	%	#	%	#	%	#	%
Mashpee	1	100.0	0	0	0	0	0	0	0	0
Mattapoisett	1	33.3	1	33.3	0	0	1	33.3	0	0
Menemsha	1	50.0	0	0	1	50.0	0	0	0	0
Nantucket	2	66.7	1	33.3	0	0	0	0	0	0
New Bedford	0	0	0	0	0	0	0	0	0	0
N. Falmouth	0	0	1	100	0	0	0	0	0	0
Oak Bluffs	0	0	0	0	0	0	0	0	0	0
Onset	0	0	1	50.0	0	0	0	0	1	50.0
Osterville	2	40.0	2	40.0	0	0	0	0	1	20.0
Somerset	1	25.0	2	50.0	1	25.0	0	0	0	0
S. Dartmouth	1	25.0	1	25.0	1	25.0	1	25.0	0	0
S. Dennis	0	0	0	0	0	0	0	0	0	0
S. Yarmouth	1	100.0	0	0	0	0	0	0	0	0
Sw ea	0	0	0	0	0	0	0	0	0	0
Vineyard Haven	2	100.0	0	0	0	0	0	0	0	0
Wareham	0	0	0	0	0	0	0	0	0	0
Waquoit	0	0	1	100	0	0	0	0	0	0
W. Dennis	0	0	1	100	0	0	0	0	0	0
W. Falmouth	0	0	0	0	0	0	0	0	0	0

Table III-4-19

MA - Volume of Future Dredging Activity 1985-1995. (in cubic yards)

Area 1	
Barnstable	35,000
Chatham	325,350
Harwich	25,500
Hyannis	38,960
Dennis	15,000
S. Dennis	0
W. Dennis	200
S. Yarmouth	10,000

Area 2	
Cataumet	200
Falmouth	102,150
E. Falmouth	5,000
N. Falmouth	400
W. Falmouth	0
Mashpee	30,200
Waquoit	0
Woods Hole	0

Area 3	
Bourne	610,470
Buzzard's Bay	0
Cape Cod Canal	100,000
Cotuit	0
E. Sandwich	0
Marston Mills	0
Onset	1,000
Osterville	11,000

Area 4	
Chilmark	0
Cutty Hunk	200,000
Edgartown	200
Menemsha	25,000
Nantucket	16,000
Oak Bluffs	0
Vineyard Haven	600

Area 5	
Dartmouth	50,000
Fairhaven	9,000
Marion	10,080
Mattapoisett	200
New Bedford	200,000
S. Dartmouth	2,200
Wareham	6,000

Area 6	
Dighton	5,000
Fall River	4,000,000
Somerset	225
Swansea	0
Westport	0

SAIC

Table III-4-20. MA - Tests on Sediments Completed

	Yes		NO		UNSURE	
	#	%	#	%	#	%
Barnstable	1	50	0	0	1	50
Bourne	2	100	0	0	0	0
Buzz. Bay	1	33.7	0	0	2	66.7
Cape Cod Canal	0	0	0	0	0	0
Cataumet	0	0	1	50	1	50
Chatham	5	100	0	0	0	0
Chilmark	0	0	0	0	1	100
Cotuit	1	50	1	50	0	100
Cuttyhunk	1	100	0	0	0	0
Dartmouth	1	50	1	50	0	0
Dennis	1	50	1	50	0	0
Dighton	1	50	1	50	0	0
E. Falmouth	1	100	0	0	0	0
E. Sandwich	0	0	1	100	0	0
Edgartown	1	100	0	0	0	0
Fairhaven	2	40	3	60	0	0
Fall River	1	50	1	50	0	0
Harwich	4	100	0	0	0	0
Hyannis	6	75	2	25	0	0
Marion	1	33.3	1	33.3	1	33.3
Marstons Mills	0	0	0	0	0	0
Mashpee	3	75	1	25	0	0
Mattapoisett	1	33.3	1	33.3	1	33.3
Menemsha	1	50	0	0	1	50
Nantuckett	0	0	2	66.7	1	33.3
New Bedford	0	0	2	66.7	1	33.3
N. Falmouth	0	0	0	0	1	100
Oak Bluffs	0	0	0	0	1	100
Onset	2	100	0	0	0	0
Osterville	2	28.6	3	42.9	2	28.6
Somerset	2	50	2	50	0	0
S. Dartmouth	3	75	1	25	0	0

Table III-4-20. Cont

	Yes		No		Unsure	
	#	%	#	%	#	%
S. Dennis	0	0	0	0	0	0
S. Yarmouth	0	0	1	100	0	0
Swansea	0	0	0	0	0	0
Vineyard Haven	1	25	2	50	1	25
Wareham	1	50	1	50	0	0
Waquoit	0	0	0	0	1	100
W. Dennis	0	0	1	100	0	0
W. Falmouth	0	0	0	0	0	0
Westport	1	50	1	50	0	0
Woods Hole	0	0	1	100	0	0
Falmouth	5	62.5	2	25	1	12.5

Table III-4-21 - Sediment Types

	Mud		Silt		Sand		Gravel		Rock		Combination	
	#	%	#	%	#	%	#	%	#	%	#	%
Barnstable	0	0	0	0	0	0	0	0	0	0	1	100.0
Bourne	0	0	0	0	2	100.0	0	0	0	0	0	0
Buzz. Bay	0	0	0	0	1	100.0	0	0	0	0	0	0
Cape Cod Canal	0	0	0	0	0	0	0	0	0	0	0	0
Cataumet	0	0	0	0	0	0	0	0	0	0	0	0
Chatham	0	0	0	0	2	66.7	0	0	0	0	1	33.3
Chilmark	0	0	0	0	1	100.0	0	0	0	0	0	0
Cotuit	0	0	0	0	0	0	0	0	0	0	0	0
Cuttyhunk	0	0	0	0	0	0	0	0	0	0	0	0
Dartmouth	0	0	0	0	0	0	0	0	0	0	0	0
Dennis	0	0	0	0	0	0	0	0	0	0	1	100.0
Dighton	0	0	0	0	0	0	0	0	0	0	1	100.0
E. Falmouth	0	0	0	0	0	0	0	0	0	0	1	100.0
E. Sandwich	0	0	0	0	1	100.0	0	0	0	0	0	0
Edgartown	0	0	1	100.0	0	0	0	0	0	0	0	0
Fairhaven	0	0	0	0	1	50.0	0	0	0	0	1	50.0
Fall River	0	0	1	100.0	0	0	0	0	0	0	0	0
Harwich	0	0	0	0	4	100.0	0	0	0	0	0	0
Hyannis	0	0	0	0	3	60.0	0	0	0	0	2	40.0
Marion	0	0	0	0	0	0	0	0	0	0	0	0
Marstons Mills	0	0	0	0	0	0	0	0	0	0	0	0

Table III-4-21. Cont

	Mud		Silt		Sand		Gravel		Rock		Combination	
	#	%	#	%	#	%	#	%	#	%	#	%
Mashpee	0	0	0	0	3	100.0	0	0	0	0	0	0
Mattapoisett	0	0	0	0	0	0	0	0	0	0	0	0
Menemsha	0	0	0	0	2	100.0	0	0	0	0	0	0
Nantucket	0	0	1	100.0	0	0	0	0	0	0	0	0
New Bedford	0	0	0	0	0	0	0	0	0	0	0	0
N. Falmouth	0	0	0	0	1	100.0	0	0	0	0	0	0
Oak Bluffs	0	0	0	0	0	0	0	0	0	0	0	0
Onset	0	0	0	0	1	100.0	0	0	0	0	0	0
Osterville	1	0	0	0	0	0	0	0	1	50.0	1	50.0
Somerset	0	0	0	0	0	0	1	100.0	0	0	0	0
S. Dartmouth	1	50.0	1	50.0	0	0	0	0	0	0	0	0
S. Dennis	0	0	0	0	0	0	0	0	0	0	0	0
S. Yarmouth	0	0	0	0	0	0	0	0	0	0	0	0
Swansea	0	0	0	0	0	0	0	0	0	0	0	0
Vineyard Haven	0	0	0	0	0	0	0	0	0	0	1	100.0
Wareham	0	0	0	0	0	0	0	0	0	0	0	0
Waquoit	0	0	0	0	0	0	0	0	0	0	0	0
W. Dennis	0	0	0	0	0	0	0	0	0	0	0	0
W. Falmouth	0	0	0	0	0	0	0	0	0	0	0	0
Westport	0	0	0	0	1	100.0	0	0	0	0	0	0
Woods Hole	0	0	0	0	0	0	0	0	0	0	0	0
Falmouth	0	0	0	0	2	66.7	0	0	0	0	1	33.3

Table III-4-22. MA - How(equently Do You Need To Dredge

	<5 Yrs.		5.1 - 10 Yrs		10.1-15 Yrs.		15.1-20 Yrs.		> 20 Yrs.		Unsure	
	#	%	#	%	#	%	#	%	#	%	#	%
Barnstable	1	50	0	0	0	0	0	0	0	0	1	50
Bourne	1	33.3	0	0	0	0	1	33.3	0	0	1	33.3
Buzz. Bay	0	0	1	16.7	0	0	0	0	0	0	5	83.3
Cape Cod Canal	0	0	0	0	0	0	0	0	0	0	1	100
Cataumet	1	50	0	0	0	0	1	50	0	0	0	0
Chatham	3	50	2	33.3	0	0	0	0	0	0	1	16.7
Chilmark	0	0	0	0	0	0	0	0	0	0	1	100
Cotuit	1	50	0	0	0	0	0	0	0	0	1	50
Cuttyhunk	0	0	0	0	1	100	0	0	0	0	0	0
Dartmouth	0	0	2	100	0	0	0	0	0	0	0	0
Dennis	2	66.7	0	0	0	0	0	0	0	0	1	33.3
Dighton	1	33.3	0	0	0	0	0	0	0	0	2	66.7
E. Falmouth	1	33.3	0	0	0	0	0	0	0	0	2	66.7
E. Sandwich	1	100	0	0	0	0	0	0	0	0	0	0
Edgartown	0	0	0	0	0	0	0	0	0	0	5	100
Fairhaven	1	16.7	1	16.7	1	16.7	0	0	1	16.7	2	33.3
Fall River	0	0	0	0	0	0	0	0	0	0	3	100
Harwich	2	40	0	0	1	20	0	0	0	0	2	40
Hyannis	5	50	3	30	0	0	0	0	0	0	2	20
Marion	0	0	1	33.3	1	33.3	0	0	0	0	1	33.3
Marstons Mills	0	0	0	0	0	0	0	0	0	0	1	100

Table III-4-22. Cont

	<5 Yrs		5.1 - 10 Yrs		10.1-15 Yrs		15.1-20 Yrs		> 20 Yrs		Unsure	
	#	%	#	%	#	%	#	%	#	%	#	%
Mashpee	0	0	3	75	0	0	0	0	0	0	1	25
Mattapoisett	2	66.7	1	33.3	0	0	0	0	0	0	0	0
Menemsha	1	33.3	1	33.3	0	0	0	0	0	0	1	33.3
Nantucket	1	16.7	1	16.7	0	0	0	0	1	16.7	3	50
New Bedford	0	0	0	0	0	0	0	0	0	0	7	100
N. Falmouth	0	0	0	0	0	0	0	0	0	0	1	100
Oak Bluffs	0	0	1	50	0	0	0	0	0	0	1	50
Onset	1	33.3	1	33.3	0	0	0	0	0	0	1	33.3
Osterville	3	33.3	3	33.3	1	11.1	0	0	0	0	2	22.2
Somerset	1	20.0	0	0	1	20.0	0	0	0	0	3	60.0
S. Dartmouth	2	40.0	2	40.0	0	0	0	0	0	0	1	20.0
S. Dennis	0	0	0	0	0	0	0	0	0	0	1	100
S. Yarmouth	0	0	1	50	0	0	0	0	0	0	1	50
Swansea	0	0	0	0	0	0	0	0	0	0	1	100
Vineyard Haven	3	50	0	0	0	0	0	0	0	0	3	50
Wareham	0	0	2	66.7	0	0	0	0	0	0	1	33.3
Waquoit	1	100	0	0	0	0	0	0	0	0	0	0
W. Dennis	1	50	0	0	0	0	0	0	0	0	1	50
W. Falmouth	0	0	0	0	0	0	0	0	0	0	1	100
Westport	0	0	2	50	0	0	0	0	0	0	2	50
Woods Hole	0	0	0	0	0	0	0	0	0	0	4	100
Falmouth	1	06.7	3	20	1	06.7	1	06.7	0	0	9	60

Menemsha on Martha's Vineyard.

Area 5 begins just west of the canal at Wareham and extends in a southwesterly direction along the coast to South Dartmouth. This area includes Wareham, Marion, Mattapoisett, and Fairhaven as well as New Bedford and Dartmouth. Historically, this area has been the home of a very large fishing fleet and related coastal industries. In addition, the area has seen a tremendous growth in both public and private recreational oriented facilities including the large pleasure craft harbor at Padanaram in South Dartmouth.

Area 6 is the westernmost portion of the survey area extending from Westport Point in the south, to Dighton in the north along the banks of the Taunton River. The city of Fall River is included in this area as well as the towns of Westport, Somerset, Swansea and Dighton. Because of the traditional industrial base in this area, waterways and dredging are important factors in the future economic viability of the area. The state pier in Fall River along with Shell Oil, Montaup Electric, and New England Power Systems may all require that channels be maintained and improved.

4.2.2 Dredged Material Quantities

This section examines, by geographical area, the relative need (Table III-4-23) and the amount (Table III-4-24) of dredged material requiring disposal during the ten year period 1985-1995. By looking at each area specifically, one will be able to see not only the quantity expected to be dredged, but also where this material will be coming from. By looking at the geographical assessment, policymakers will be better able to determine the optimal location of a dredged materials disposal site.

Area 1 (Barnstable, Chatham, Dennis, Harwich, Hyannis, S. Dennis, S. Yarmouth and W. Dennis). Respondents from this geographical cluster estimate that approximately 450,000 cubic yards of dredged material will be removed during the next ten years. The maximum amount to be removed in any one municipality was 250,000 yd^3 in Chatham involving two dredging projects. The minimum amount to be removed is 200 yd^3 in Dennis in a single project.

Because of the extensive economic importance of the tourist industry in this area, the maintenance and expansion of boating facilities is of special importance. In order to maintain their operations, facility owners and operators feel the need to dredge in order to accomodate different types and sizes of pleasure craft. Geographically, this area has been a shoaling troublespot, requiring frequent dredging operations to maintain its tourist attraction.

Area 2 (Cataumet, Falmouth, North Falmouth, East Falmouth, West Falmouth, Falmouth, Mashpee, Waquoit and Woods

TABLE III-4-23

Planned Dredging Over The Next Ten Years
By Geographical Cluster-Massachusetts

	TOTAL RESPONDENTS	%	WILL DREDGE	%	WILL NOT DREDGE	%	UNSURE	%
AREA 1	31	19.0	22	70.9	8	25.8	1	3.2
AREA 2	30	18.4	17	56.7	11	36.7	2	6.7
AREA 3	26	15.9	17	65.4	9	34.6	0	0.0
AREA 4	24	14.7	14	58.3	9	37.5	1	4.2
AREA 5	29	17.8	21	72.4	8	27.6	0	0.0
AREA 6	16	9.8	8	50.0	8	50.0	0	0.0

TABLE III-4-24

DREDGED MATERIAL QUANTIFIED BY GEOGRAPHICAL CLUSTER-MASSACHUSETTS

	Total Material (Cubic Yards)	Maximum Project	Minimum Project
Area 1:	450,010	250,000	200
Area 2:	250,000	100,000	200
Area 3:	721,470	534,470	1,000
Area 4:	241,800	200,000	200
Area 5:	277,480	200,000	200
Area 6:	4,005,225	4,000,000	225
Total:	5,945,985		

Total in Southeastern Massachusetts: 5,945,985 cubic yards of dredged material.

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Hole). Within this geographical cluster, it was found that dredging activity would generate approximately 250,000yd^3 of dredged material. The largest project, however, in this area is planned in the Falmouth area with 100,00 yd^3 being dredged in a single project. The smallest project, with a projected 200 yd^3 of dredged material is scheduled to take place in Cataumet.

The oceanographic industry has attracted many high technology firms to this area of Cape Cod over the last ten years. Federal, state and private institutions in and around Woods Hole and Falmouth require that coastal boating resources be maintained and expanded to sustain the economic growth that has taken place and to attract more industry in the future. Waterways must be maintained at current levels and in some cases deepened so that the potential for economic development is unhindered.

Area 3 (Bourne, Buzzards Bay, Cape Cod Canal, Conuit, East Sandwich, Marston Mills, Onset and Osterville). In this Upper and Mid-Cape area, survey respondents estimated that approximately 721,470 yd^3 of dredged material would be generated during the next ten year period. By a substantial margin, the largest single project in the area is planned for the east boat basin in Sandwich, with 534,470 yd^3 to be removed. Even though this project is just outside the study area, there is the potential for its disposal at a regional disposal site within the study area and, therefore, is included in this survey. In contrast, the smallest project is planned to take place in Onset with a quantity of 1,000 yd^3 being removed.

The federal government, through the U.S. Army Corps of Engineers, has planned an expansion dredging project in the Buttermilk Bay area of Bourne. This planned dredging would open up additional watercourses for recreational, commercial and industrial development.

Area 4 (Chilmark, Cuttyhunk, Edgartown, Menemsha, Nantucket, Oak Bluffs, Vineyard Haven). In this, the island portion of our survey area, it is estimated that a total of 241,800 yd^3 would be dredged over the next ten years. On Cuttyhunk, in the Elizabethan Island chain, it is estimated that 200,000 yd^3 would be dredged in one project alone. On the other hand, a planned project in Edgartown on Martha's Vineyard was expected to produce only 200 yd^3 of dredged material.

Because this area consists totally of islands, waterway maintenance takes on a special importance. Marinas, docks, boatyards ramps and channels of these islands are indeed their lifeblood. Without adequately maintained coastal facilities, this area would lose a prime source of income from the lost tourist trade. Furthermore, many aspects of life taken for granted on the mainland are dependent on waterway transit on the islands. Continued economic prosperity requires the maintenance and improvement of these waterways. Historically, most island areas do not have the chronic shoaling problems that are seen on the south coast of Cape Cod, however, some dredging must be done in certain locations to maintain a minimum draft.

Area 5 (Dartmouth, Fairhaven, Marion, Mattapoisett, New Bedford, South Dartmouth, Wareham). The total amount of dredged material expected to be generated in this area is approximately 277,480 yd^3. The city of New Bedford has planned a project that will alone generate 200,000 yd^3 of material if undertaken as scheduled. Dredging estimates from New Bedford Harbor do not include any officially designated Superfund sites. The town of Mattapoisett, however, is expected to produce only 200 yd^3 of dredged material during the same time span.

This area is far more industrialized than areas on Cape Cod. Communities from Wareham to Dartmouth are heavily dependent upon coastal resources. They include boat building and repair facilities, fish, lobster and scallop fisheries, and pleasure craft sales, as well as the numerous other industries that supply and support them. The city of New Bedford has one of the nation's largest fishing fleets, as well as a well-developed fish processing and packaging industry.

Area 6 (Dighton, Fall River, Somerset, Swansea and Westport). This geographical area has a special significance in reference to quantities of dredged materials in Southeastern Massachusetts. The proposed Federal Project which would in effect deepen the Fall River Harbor Channel from 35 feet (mean low tide) to 40 feet could generate in excess of 4,000,000 yd^3 of dredged material. When coupled with several smaller projects which are slated for this area, one could expect a total of approximately 4,0005,225 yd^3 of dredged material. In contrast to the huge Fall River Harbor Project, the minimum to be dredged in any one location is 225 yd^3 in the town of Somerset.

In Southeastern Massachusetts as a whole, it is expected that nearly 6 million cubic yards of dredged material will be generated by dredging activities in the area during the next ten years. Much of this activity is necessary in order to maintain, improve and expand the coastal facilities, boatyards, marinas, yacht clubs, fishing ports and industries that rely upon accessibility to local and federal waterways. Historically, this area has prospered and developed because of the coastal resources that exist and the impact they have had on the area's economy.

5.0 SUMMARY

The results of the survey for the 1985-1995 period conducted in Rhode Island and Massachusetts were similar in several respects. First, the majority of respondents cited adverse impact due to the no dredging alternative during the 1981-85 time frame as a result of no available open water disposal site. Likewise, a majority of respondents cited a need to dredge in the next ten years, noting adverse impacts if no dredging occurs. The estimated volumes of projected material to be dredged for the ten year period are 3.8 million cubic yards in Rhode Island and 5.9 million cubic yards in Massachusetts. The

Rhode Island projects are primarily for expansion while the Massachusetts projects are primarily for maintenance. The proposed Fall River Harbor improvement project with an estimated 4.0 million cubic yards is by far the largest project in the region, accounting for 42% of the total. Aside from the industries located in Fall River Harbor, the type of facilities most affected in both regions are the commercial marinas and boatyards, reflecting the large and prosperous recreational and fishing industries of the region.

A summary chart showing the overall distribution of future dredging requirements is enclosed as Plate #1. The study has pinpointed three major regions of potential dredging operations: upper Buzzards Bay, Fall River, and upper Narragansett Bay north of Davisville. These data will provide relevant information for the potential need and possible location of a dredged material disposal site for the region.

APPENDIX

Table 1

Rhode Island Dredging

Needs Survey Mailing List

ID	LOCATION AND DESCRIPTION
1	CARDONE MARINE SERVICE, WESTERLY
2	WESTERLY MARINA, WESTERLY
3	RIVER BEND BOAT YARD, WESTERLY
4	WESTERLY YACHT CLUB, WESTERLY
5	FRANK HALL BOAT YARD, WESTERLY
6	COVEDGE BAIT AND TACKLE, WESTERLY
7	LOTTERYVILLE MARINA, WESTERLY
8	AVONDALE BOATYARD, WESTERLY
9	WATCH HILL BOATYARD, WESTERLY
10	HOB YACHT SALES AND WATCH HILL MUNICIPAL DOCKS, WATCH HILL
11	WATCH HILL YACHT CLUB, WATCH HILL
12	GRAY BOATYARD, WESTERLY
13	WEEKAPAUG YACHT CLUB, WEEKAPAUG
14	WEEKAPAUG MARINA & FIRE DISTRICT, WEEKAPAUG
15	THE SPORTSMANS COVE, BRADFORD
16	SHADY HARBOR DOCKING ASSOC. (DONALD KEIL), CHARLESTOWN
17	CALVIN PEARSON, CHARLESTOWN
18	OCEAN HOUSE MARINA, CHARLESTOWN
19	SHELTER COVE MARINA, CHARLESTOWN
20	CHARLESTOWN BREACHWAY
21	CHARLESTOWN BREACHWAY RAMP
22	QUONOCHAUNTAUG RAMP
23	SKIPS DOCK, SO. KINGSTOWN
24	JIMS DOCK, SO. KINGSTOWN
25	KENPORT MARINA, SO. KINGSTOWN
26	SNUG HARBOR MARINA, SO. KINGSTOWN
27	OCEAN STATE MARINE RAILWAY, SO. KINGSTOWN
28	POINT JUDITH MARINA, SO. KINGSTOWN
29	SALT POND MARINE RAILWAY, SO. KINGSTOWN
30	BILLINGTON COVE MARINA, SO. KINGSTOWN
31	SILVER SPRING COVE MARINA, SO. KINGSTOWN
32	RAM POINT MARINA
33	SNUG HARBOR RAMP, SO. KINGSTOWN
34	MARINA PARK RAMPS (2), SO. KINGSTOWN
35	POND ST. RAMP, SO. KINGSTOWN
36	GREAT ISLAND BRIDGE RAMP, NARRAGANSETT
37	URI SAILING CLUB, SO. KINGSTOWN
38	CAPN JACKS MARINA, SO. KINGSTOWN
39	POINT JUDITH YACHT CLUB, SO. KINGSTOWN
40	STONE COVE MARINA, SO. KINGSTOWN
41	LONG JOHNS MARINA, SO. KINGSTOWN
42	POINT JUDITH COAST GUARD, NARRAGANSETT
43	URI DOCK & MOORAGE, NARRAGANSETT
44	LONG COVE MARINA, SO. KINGSTOWN
45	RHODE ISLAND ENGINE CO., SO. KINGSTOWN
46	FISHS BAIT SHOP, NARRAGANSETT
47	J.L. SHELLFISH, NARRAGANSETT
48	POINT JUDITH FISHERMAN,S COOP, NARRAGANSETT
49	STATE PIER #3, GALILEE
50	STATE PIER #4, JERUSALEM
51	STATE PIER #5 (OCEAN RD), NARRAGANSETT
52	GALILEE RAMP, NARRAGANSETT
53	NARROW RIVER RAMP, SO. KINGSTOWN
54	MIDDLEBRIDGE MARINA, SO. KINGSTOWN
55	RAIN BRO MARINA, SO. KINGSTOWN
56	PETER GREENE, NARRAGANSETT
57	CHAMPLINS MARINA, BLOCK ISLAND
58	BLOCK ISLAND BOAT BASIN
59	PAYNES NEW HARBOR DOCK, BLOCK ISLAND
60	PENNINGTON SPRAGUE, INC., BLOCK ISLAND
61	SMUGGLERS COVE, BLOCK ISLAND
62	BLOCK ISLAND COAST GUARD
63	TWIN MAPLES, BLOCK ISLAND
64	JOHN CALHOUN, DOCKMASTER (OLD HARBOR), BLOCK ISLAND
65	LOU RITZINGER, HARBORMASTER (NEW HARBOR), BLOCK ISLAND
66	HARBOR ROAD YACHT BASIN, BLOCK ISLAND
67	INTERSTATE NAVIGATION CO., BLOCK ISLAND
68	SAUNDERSTOWN YACHT CLUB, NO. KINGSTOWN
69	WICKFORD COVE MARINA, NO. KINGSTOWN
70	WICKFORD SHIPYARD, NO. KINGSTOWN
71	WICKFORD MARINE & SUPPLY, NO. KINGSTOWN
72	WICKFORD TOWN DOCK, NO. KINGSTOWN
73	TOWN DOCK (AT BRIDGE), NO. KINGSTOWN
74	INTREPID AVE. RAMP, NO. KINGSTOWN
75	PLUM BEACH CLUB, NO. KINGSTOWN
76	RI PORT AUTHORITY, NO. KINGSTOWN
77	ELECTRIC BOAT, NO. KINGSTOWN
78	WICKFORD SHELLFISH, NO. KINGSTOWN
79	ALLENS HARBOR YACHT CLUB, NO. KINGSTOWN
80	EDS BOAT STATION, NO. KINGSTOWN
81	JOHNSONS BOATYARD, NO. KINGSTOWN
82	PLEASANT ST. WHARF, NO. KINGSTOWN
83	WICKFORD YACHT CLUB, NO. KINGSTOWN
84	CODDINGTON YACHT CENTER, JAMESTOWN
85	ROUND HOUSE SHIPYARD, JAMESTOWN
86	CONANICUT MARINE SERVICES, JAMESTOWN
87	TOWN DOCK & RAMP, JAMESTOWN
88	FORT GETTY RAMP, JAMESTOWN
89	CONANICUT YACHT CLUB, JAMESTOWN
90	DUTCH HARBOR SHIPYARD, JAMESTOWN
91	WEST FERRY PIER, JAMESTOWN
92	FORT WETHERILL RAMP, JAMESTOWN
93	E. GREENWICH YACHT CLUB, E. GREENWICH
94	E. GREENWICH TOWN DOCK & RAMP

95 MARINER HOUSE, E. GREENWICH
96 ARNOLDS BOAT SHOP, INC., E. GREENWICH
97 WAREHOUSE TAVERN, E. GREENWICH
98 HARBORSIDE LOBSTERMANIA, E. GREENWICH
99 MILTS MARINA, E. GREENWICH
100 NORTONS SHIPYARD & MARINA, E. GREENWICH
101 BREEZIE POINT DOCK, WARWICK
102 MARYS CREEK RAMP, WARWICK
103 DIVISION ST. RAMP, WARWICK
104 COLES FARM RAMP, WARWICK
105 TREATMENT PLANT RAMP, E. GREENWICH
106 ASHBURY BOATHOUSE RAMP, PAWTUXET
107 CONIMICUT POINT RAMP, WARWICK
108 WARWICK DOWNS RAMP, WARWICK
109 EDGEWATER BEACH RAMP, WARWICK
110 ROCK AVE. RAMP, WARWICK
111 GASPEE COVE RAMP, WARWICK
112 HARROP AVE. RAMP, WARWICK
113 EDGEWATER BEACH RAMP (NEARBY), WARWICK
114 LONGMEADOW RAMP, WARWICK
115 OAKLAND BEACH AVE. RAMP, WARWICK
116 GODDARD STATE PARK RAMP, WARWICK
117 OAKLAWN BEACH STATE RAMP, WARWICK
118 LONGMEADOW STATE RAMP, WARWICK
119 PASEONIKQUIS COVE RAMP, WARWICK
120 CONIMICUT STATE RAMP, WARWICK
121 NICKS DOCK, WARWICK
122 C-LARK MARINA, WARWICK
123 RICHARD CATALDI, WARWICK
124 GREENWICH BAY YACHT BASIN ASSOCIATES, WARWICK
125 BREWER YACHT YARD, WARWICK
126 MASTHEAD MARINA, WARWICK
127 APPONAUG HARBOR MARINA, WARWICK
128 THE PONAUG MARINA, WARWICK
129 LITTLE RHODY YACHT CLUB, WARWICK
130 BAYVIEW SHELLFISH, WARWICK
131 ANGELS MARINA, WARWICK
132 WARWICK COVE MARINA, WARWICK
133 SOUND MAR ASSOCIATES, WARWICK
134 GULL MARINA, WARWICK
135 BENZAS WEST SHORE MARINE, WARWICK
136 WHARF MARINE, WARWICK
137 CARLSONS MARINA, WARWICK
138 WINSTEADS MARINA, WARWICK
139 HARBOR LIGHT MARINA, WARWICK
140 PETTIS MARINE BROKERAGE, WARWICK
141 PAWTUXET COVE MARINA & YACHT CLUB, CRANSTON
142 RHODE ISLAND YACHT CLUB, CRANSTON
143 EDGEWOOD YACHT CLUB, CRANSTON
144 PORT EDGEWOOD, LTD, CRANSTON
145 NARRAGANSETT YACHT CLUB, CRANSTON
146 WILKES BARRE PIER (P & W RAILROAD), E. PROVIDENCE
147 SOUTH KEY (P & W RAILROAD), E. PROVIDENCE
148 PROMET MARINE SERVICES, PROVIDENCE
149 C.H. SPRAGUE CO., PROVIDENCE
150 NARRAGANSETT ELECTRIC, PROVIDENCE
151 AMOCO OIL, E. PROVIDENCE
152 ARCO OIL, E. PROVIDENCE
153 PROVIDENCE TERMINAL ASSOCIATES, PROVIDENCE
154 BRITISH PETROLEUM, PROVIDENCE
155 N.E. PETROLEUM, PROVIDENCE
156 SUN REFINING & MARKETING, PROVIDENCE
157 PETROLANE, INC., PROVIDENCE
158 N.E. BITUMINOUS, PROVIDENCE
159 PROVIDENCE STEAMBOAT CO., PROVIDENCE
160 INDEPENDANT CEMENT, PROVIDENCE
161 LEHIGH/PORTLAND CEMENT, PROVIDENCE
162 MARSTON BOATHOUSE (BROWN UNIVERSITY), PROVIDENCE
163 MUNICIPAL WHARF, PROVIDENCE
164 ALGONQUIN GAS, PROVIDENCE
165 TEXACO, PROVIDENCE
166 INDIA ST. FERRY DOCK, PROVIDENCE
167 SEABOARD CONSTRUCTION CO., PROVIDENCE
168 MARINE MACHINERY SERVICE, PROVIDENCE
169 PAWTUCKET REDEVELOPMENT AGENCY, PAWTUCKET
170 PARENTS MARINA, PAWTUCKET
171 GETTY REFINING & MARKETING, E. PROVIDENCE
172 UNION CHEMICALS, E. PROVIDENCE
173 SABIN POINT PARK RAMP, E. PROVIDENCE
175 OYSTER HOUSE MARINA, E. PROVIDENCE
174 GULF OIL, EAST PROVIDENCE
176 MOBIL OIL, EAST PROVIDENCE
177 E. PROVIDENCE YACHT CLUB
178 NARRAGANSETT TERRACE BOATYARD, E. PROVIDENCE
179 BULLOCKS POINT BOATYARD & MARINA, E. PROVIDENCE
180 POLICE RAMP, BARRINGTON
181 HAINES PARK RAMP, BARRINGTON
182 STANLEYS BOATYARD & TYLER POINT YACHT CLUB, BARRINGTON
183 BARRINGTON YACHT CLUB
184 STRIPER MARINA, BARRINGTON
185 COVE HAVEN MARINA, BARRINGTON
186 LAVINS MARINA, BARRINGTON
187 TOWN DOCK & BOAT RAMP, WARREN
188 KICKEMUIT MARINA, WARREN
189 CUNARD SHELLFISH, WARREN
190 BLOUNT SEAFOOD, WARREN
191 TOUISSET POINT MARINA, WARREN
192 BLOUNT MARINE CORP., WARREN
193 WATER ST. DOCK, (BLOUNT), WARREN
194 JOES BOATYARD, WARREN

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195 THE ANCHORAGE, WARREN
196 WHARF TAVERN, WARREN
197 HITCHCOCK MARINE SERVICES, WARREN
198 HARBOR MARINE CORP., WARREN
199 SPEEDS MARINE SERVICE, WARREN
200 SOUTH PRUDENCE ISLAND DOCK
201 PRUDENCE ISLAND FERRY DOCK
202 NORTH PRUDENCE ISLAND DOCK
203 PATIENCE ISLAND DOCK
204 HOPE ISLAND DOCK
205 DUTCH ISLAND DOCK
206 U.S. COAST GUARD, BRISTOL
207 HERRESHOFF MUSEUM DOCK, BRISTOL
208 CHURCH ST. DOCK, BRISTOL
209 STATE ST. DOCK & RAMP, BRISTOL
210 ROCKWELL DOCK, BRISTOL
211 COLT STATE PARK RAMP, BRISTOL
212 GILBERTS SEAFOOD, BRISTOL
213 BRISTOL YACHT CLUB
214 BRISTOL MARINE CO.
215 LIGHTHOUSE MARINE, PORTSMOUTH
216 STONE BRIDGE MARINA & SEAFOOD, PORTSMOUTH
217 GULL COVE RAMP, PORTSMOUTH
218 MT. HOPE RAMP, PORTSMOUTH
219 BEND BOAT BASIN, PORTSMOUTH
220 MOUNT HOPE MARINA HOUSE, PORTSMOUTH
221 PIRATE COVE MARINA, PORTSMOUTH
222 POINT BOAT YARD, PORTSMOUTH
223 BREWER'S SAKONNET MARINA, PORTSMOUTH
224 MELVILLE MARINE INDUSTRIES, PORTSMOUTH
225 DIRECKTOR SHIPYARD, MIDDLETOWN
226 ROSE ISLAND MARINA (PROPOSED), NEWPORT
227 MUSEUM OF YACHTING DOCKS, NEWPORT
228 KINGS PARK RAMP, NEWPORT
229 ANN ST. PIER, NEWPORT
230 WASHINGTON ST. PIER, NEWPORT
231 ELM ST. RAMP & DOCK, NEWPORT
232 WILLOW ST. RAMP, NEWPORT
233 POPLAR ST. RAMP, NEWPORT
234 INN-ON-THE-HARBOR, NEWPORT
235 INN-AT-LONG-WHARF, NEWPORT
236 OLD PORT MARINE, NEWPORT
237 TOWN MOORINGS, NEWPORT
238 INN AT CASTLE HILL
239 U.S. COAST GUARD, CASTLE HILL
240 STEAMSHIP LANDING, NEWPORT
241 NEWPORT YACHT CLUB, NEWPORT
242 LONG WHARF MOORING MARINA, NEWPORT
243 TREADWAY MARINA, NEWPORT
244 BANNISTERS WHARF, NEWPORT
245 NEWPORT YACHTING CENTER, NEWPORT
246 CHRISTIES LANDING, NEWPORT
247 NEWPORT OFFSHORE, NEWPORT
248 NEWPORT ONSHORE, NEWPORT
249 CODDINGTON LANDING, NEWPORT
250 WELLINGTON LANDING, NEWPORT
251 WILLIAMS & MANCHESTER SHIPYARD, NEWPORT
252 IDA LEWIS YACHT CLUB, NEWPORT
253 GOAT ISLAND MARINA, NEWPORT
254 STATE PIER #7, NEWPORT
255 NEWPORT NAVY YACHT CLUB, NEWPORT
256 BOWEN'S WHARF COMP., NEWPORT
257 TALLMAN & MACK FISH CO., NEWPORT
258 NEWPORT OIL CORP., NEWPORT
259 ANTHONYS SEAFOOD, NEWPORT
260 AQUIDNECK LOBSTER CO., NEWPORT
261 OCEAN CLIFF HOTEL, NEWPORT
262 THIRD BEACH RAMP, NEWPORT
263 KINGS BEACH RAMP, NEWPORT
264 FORT ADAMS RAMP, NEWPORT
265 FUEL STORAGE CORP., TIVERTON
266 NORTHEAST PETROLEUM, TIVERTON
267 TIVERTON TOWN DOCK
268 GRINNELLS RAMP, TIVERTON
269 FOGLAND RAMP, TIVERTON
270 SAPOWET POINT RAMP, TIVERTON
271 RIVERSIDE MARINE, TIVERTON
272 SHANNON BOATYARD, TIVERTON
273 TIVERTON YACHT CLUB
274 STANDISH BOAT YARD, TIVERTON
275 MANCHESTER SEAFOODS, TIVERTON
276 SAKONNET POINT RAMP, LITTLE COMPTON
277 POINT TRAPP CO., LITTLE COMPTON
278 FOCLE RESTAURANT, LITTLE COMPTON
279 MATERONAS BOAT SERVICE, LITTLE COMPTON
280 SAKONNET YACHT CLUB, LITTLE COMPTON
281 FEDERAL IMPROVEMENT PROJECT, JERUSALEM
282 FEDERAL IMPROVEMENT PROJECT, POINT JUDITH
283 FEDERAL MAINTENANCE PROJECT, APPONAUG COVE
284 FEDERAL MAINTENANCE PROJECT, BLOCK ISLAND
285 FEDERAL MAINTENANCE PROJECT, COASTER'S HARBOR, BLOCK ISLAND
286 FEDERAL MAINTENANCE PROJECT, GREAT SALT POND
287 FEDERAL MAINTENANCE PROJECT, WATCH HILL COVE
288 FEDERAL MAINTENANCE PROJECT, NEWPORT HARBOR
289 FEDERAL MAINTENANCE PROJECT, PAWTUXET COVE
290 FEDERAL MAINTENANCE PROJECT, POINT JUDITH (HARBOR OF REFUGE)
291 FEDERAL MAINTENANCE PROJECT, PROVIDENCE RIVER
292 FEDERAL MAINTENANCE PROJECT, SAKONNET HARBOR
293 FEDERAL MAINTENANCE PROJECT, SEEKONK RIVER
294 FEDERAL MAINTENANCE PROJECT, WARWICK COVE
295 FEDERAL MAINTENANCE PROJECT, WICKFORD HARBOR

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APPENDIX

Table 2

Massachusetts Dredging

Needs Survey Mailing List

TOWN OF FALMOUTH
WATERWAYS COMMITTE
SCRANTON AVENUE
FALMONTH MA 02540

J.F. REALTY TRUST
ATTN: FRED WOFNELLE
BOX 610
FALMONTH MA 02540

TOWN OF FALMOUTH
TOWN HALL
FALMOUTH MA 02540

FALMOUTH YACHT CLB
P.O.BOX DRAWER V
FALMOUTH MA 02541

CAPT.KIDD RESTRNT
77 MAIN STREET
WOODS HOLE MA 02543

WOODS HOLE MARINA
89 WATER ROAD
WOODS HOLE MA 02543

W.H. YACHT CLUB
BARNECK ROAD
WOODS HOLE MA 02543

W.H.& M.V.& N.AUTH
JOHN MC CUE
P.O. BOX 284
WOODS HOLE MA 02543

WOODS HOLE M.V.
P.O. BOX 204
WOODS HOLE MA 02543

TRUST.OF NASHUWENA
JOHN M. FORBES
P.O. BOX 292
WOODS HOLE MA 02543

MONUMENT BCH MARIN
OFF EMMONS ROAD
MONUMENT BEACH MA 02553

NANTUCKET SHIPYARD
INC.
WASHINGTON ST. EXT.
NANTUCKET MA 02554

NANTUCKET BOAT
BASIN
ZERO MAIN RD.
NANTUCKET MA 02554

NANTUCKET SHIP
CHANDLERY CORP.
OLD SOUTH WHARF
NANTUCKET MA 02554

NANTUCKET YACHT
CLUB
SOUTH BEACH ROAD
NANTUCKET MA 02554

FIDLERS COVE MARIN
FIDDLERS COVE ROAD
N. FALMOUTH MA 02556

FIDDLER'S MARINA
2 SWEET ROAD
NORTH FALMOUTH MA 02556

BALLENTINE LND.ASS
OLD MAIN ROAD
N. FALMOUTH MA 02556

CHURCH'S PIER
OAK BLUFFS HARBOR
OAK BLUFFS MA 02557

OAK BLUFFS HARBOR
MARINA
P.O. BOX 493
OAK BLUFFS MA 02557

ONSET BAY MARINA
GREEN STREET
ONSET MA 02558

POINT INDEPENDENCE
YACHT CLUB
P.O. BOX 357
ONSET MA 02558

PARKERS BOAT YARD
67 RED BROOK HBR RD.
CATAUMET MA 02534

CATAUMET MARINA
SHORE ROAD
CATAUMET MA 02534

MENEMSHA TOWN DOCK
MENEMSHA ROAD
CHILMARK MA 02535

MENEMSHA TEXACO
MENEMSHA ROAD
CHILMARK MA 02535

EDWARDS BOAT YARD
1207 MAIN STREET
E.FALMOUTH MA 02536

GREEN POND YACHT
70 GREEN HARBOR RD.
E. FALMOUTH MA 02536

NOLISHA RLTY.& TST
FRED P. WORMELLE
113 MADELINE ROAD
E. FALMOUTH MA 02536

EDWARDS BOAT YARD
WHITE'S LANDING ROAD
E. FALMOUTH MA 02536

CLIFFORD HAGBERG
09 STONEFIELD DR.
E. SANDWICH MA 02537

EDGARTOWN YACHT
CLUB
FOOT MAIN ROAD
EDGARTOWN MA 02539

EDGARTOWN MARINA
MORSE ROAD
EDGARTOWN MA 02539

MAC DOUGALL'S
CAPE COD MARINE
FALMOUTH HEIGHTS RD.
FALMOUTH MA 02540

EAST MARINA
P.O. BOX 610
FALMOUTH MA 02540

FALMOUTH HBR.YACHT
FALMOUTH HEIGHTS RD.
FALMOUTH MA 02540

GUN & TACKLE
56 SCRANTON AVE.
FALMOUTH MA 02540

PIER 37
64 SCRANTON AVE.
FALMOUTH MA 02540

FALMOUTH HBR.MARIN
180 SCRANTON AVE.
FALMOUTH MA 02540

FLYING BRIDGE REST
SCRANTON AVE.
FALMOUTH MA 02540

FALMOUTH MARINE
SCRANTON AVE.
FALMOUTH MA 02540

WOODS HOLE BOAT
227 CLINTON AVE.
FALMOUTH MA 02540

PIER 37, INC.
64 SCRANTON AVE.
FALMOUTH MA 02540

MARTHA'S VINEYARD
SHIPYARD
BEACH ROAD
VINEYARD HAVEN MA 02568

THE PILOT HOUSE
BEACH ROAD
VINEYARD HAVEN MA 02568

COASTWISE WHARF CO
BEACH ROAD
VINEYARD HAVEN MA 02568

VINEYARD HAVEN
MUNICIPAL DOCK
SPRING ROAD
VINEYARD HAVEN MA 02568

DBA/BURT MARINA
STYLES LIMITED
P.O. BOX 1658
VINEYARD HAVEN MA 02568

TOWN OF TISBURY
BOARD OF SELECTMAN

VINEYARD HAVEN MA 02568

WARR'S MARINE, INC.
MAIN STREET
WAREHAM MA 02571

WEST FALMOUTH DOCK
OLD DOCK ROAD
W. FALMOUTH MA 02574

HYANNIS MARINA
ARLINGTON STREET
HYANNIS MA 02601

LEWIS BAY MARINA
53 SOUTH STREET
HYANNIS MA 02601

HYANNIS YACHT CLUB
OFF OCEAN ROAD
HYANNIS MA 02601

HYANNIS MARINA SER
ARLINGTON STREET
HYANNIS MA 02601

TOWN OF BARNSTABLE
397 MAIN STREET
HYANNIS MA 02601

THOMAS V.GILDEA JR
64 CHANNEL POINT RD.
HYANNIS MA 02601

GOLDBUG, MASON
5 RANGELEY ROAD
BROOKLINE MA 0261?

RYDERS BOAT YARD
TOWN LANDING RD.
CHATAMPORT MA 02633

STAGE HARBOR MARIN
BRIDGE STREET
CHATAM MA 02633

OLD MILL BOAT YARD
STAGE HARBOR RD.
CHATAM MA 02633

TOWN OF CHATAM BRD. OF SELECTMAN
TOWN HALL
MAIN STREET
CHATAM MA 02633

FOUR FAMILY TRUST
P.O. BOX 666
CHATAM MA 02633

PECK'S BOATS
RT.28
COTUIT MA 02635

HARBORVIEW CLUB
MAIN RD.
COTUIT MA 02635

JULIA SORIN
LEILA SORIN
BLUFF PNT. DRIVE
COTUIT MA 02635

SAIC

SAQUATUCKET MARINA
P.O. BOX 993
HARWICH MA 02645

TOWN OF HARWICH
TOWN HALL
MAIN STREET
HARWICH MA 02645

[illegible] GARFIELD
P.O. BOX [illegible]
[illegible] MA [illegible]

THOMPSON BROTHERS
SNOW INN ROAD
HARWICH PORT MA 02646

ALLEN HBR. MARINE
LOWER COUNTY ROAD
HARWICH PORT MA 02646

ALLEN HARBOR YACHT
LOWER COUNTY ROAD
HARWICH PORT MA 02646

TOWN OF MASHPEE
OFFICE OF SELECTMAN
GREAT NECK RD.
MASHPEE MA 02649

WIANNO YACHT CLUB
MAIN OFFICE
OFF BRIDGE ROAD
OSTERVILLE MA 02655

CROSBY YACHT YARD
72 CROSBY CIRCLE
OSTERVILLE MA 02655

C.A. CROSBY & SONS
OFF BRIDGE RD.
OSTERVILLE MA 02655

MICHAEL DEELEY
P.O. BOX 397
OSTERVILLE MA 02655

GEORGE WELLS
P.O. BOX 487
192 GARRISON
OSTERVILLE MA 02655

OYSTER HARBORS
ANDREW EDMONDS
SEAPUIT RIVER ROAD
OSTERVILLE MA 02655

ANDREW EDMONDS
SEAPUIT RIVER ROAD
OSTERVILLE MA 02655

CHESTER A. CROSBY
PATRICIA CROSBY
138 BRIDGE STREET
OSTERVILLE MA 02655

JOSEPH J. SOUZA
LORRAINE SOUZA
BRIDGE STREET
OSTERVILLE MA 02655

RICHARD M. BURNS
229 MAIN STREET
OSTERVILLE MA 02655

SHIP SHOPS, INC.
J. SHIPALAUSKI
PLEASANT BASS RIVER
S. DENNIS MA 02660

TOWN OF DENNIS
ATTN: R. WHEATLEY
P.O. BOX D
S. DENNIS MA 02660

TOWN OF DENNIS
TOWN HOUSE

SO. DENNIS MA 02660

TOWN OF YARMOUTH
TOWN HALL
STATE ROAD
SO. YARMOUTH MA 02664

TOWN OF YARMOUTH
1143 RT.28
S. YARMOUTH MA 02664

DANIEL J. DONAHUE
73 NEPTUNE LANE
SO. YARMOUTH MA 02664

SAIC

CURTIS G. BOYDEN
77 NEPTUNE LANE
SO. YARMOUTH MA 02664

BASS RIVER MARINA
RT. 28
W. DENNIS MA 02670

JOHN DAVENPORT
BOX 218
WEST DENNIS MA 02670

NEW BEDFORD YACHT CLUB
208 ELM STREET
DARTMOUTH MA 02714

CONCORDIA COMPANY INC.
S. WHARF STREET
DARTMOUTH MA 02714

TAUNTON YACHT CLUB
WATER STREET
DIGHTON MA 02715

D.N. KELLY & SONS INC.
32 WATER STREET
FAIRHAVEN MA 02719

FAIRHAVEN MARINE INC.
50 FRONT STREET
FAIRHAVEN MA 02719

CAPT. J.J. CONNELL
220 RIVER STREET
FALL RIVER MA 02722

ROGER FORTIER
12 SULLIVAN AVENUE
SOMERSET MA 02725

DON'S MARINA
3937 RIVERSIDE AVE.
SOMERSET MA 02726

BURR BROTHERS BOAT YARD
309 FRONT STREET
MARION MA 02738

BARDEN'S BOAT YARD INC.
2 ISLAND WHARF
MARION MA 02738

BEVERLY YACHT CLUB
99 WATER STREET
MARION MA 02738

DAVID B. STONE
GREAT HILL FARM
E. MARION MA 02738

CARLETON BURR
307 FRONT STREET
MARION MA 02738

TOWN DOCK
P.O. BOX 189
MATTAPOISETT MA 02739

MATTAPOISETT BOAT YARD
NEDD'S POINT ROAD
MATTAPOISETT MA 02739

CITY OF N.B.
N.B. CITY HALL
NEW BEDFORD MA 02745

TOWN OF DARTMOUTH
BOX 128
SOUTH DARTMOUTH MA 02747

DAVIS & TRIPP, INC.
1 BRIDGE STREET
SOUTH DARTMOUTH MA 02749

DAVID A. CHIPMAN
54 CAPTAIN'S LANE
SOUTH DARTMOUTH MA 02745

MONTAUP ELECTRIC
P.O. BOX 391
FALL RIVER MA 02722

WYATT GAFFIELD
P.O. BOX 225
PRINCETON MA 01554

HOWARD G.FREEMAN
ESTHER FREEMAN
16 MONTCLAIR DRIVE
WORCESTER MA 01609

TOWN OF COHASSET
HARRY RITTER-HER.MST

COHASSET MA 02025

SIMMIS YACHT. INC.
HAROLD G. SIMMIS
DRIFTWAY ROAD
SCITUATE MA 02066

ROBERT H. DESMOND
CHARLES F. EADES
50 BEACON STREET
BOSTON MA 02108

LOUIS W. CABOT
ALBERT PRATT
125 HIGH STREET
BOSTON MA 02110

OYSTER R/HILL ASSO
C/O PARKER BUTTS
400 ARSENAULT STREET
WATERTOWN MA 02172

JOHN CAMILLIEU
1 HALL ROAD
STONEHAM MA 02180

EDMUND LOURIE
57 JUNIPER ROAD
WESTON MA 02193

FIELD'S FNT. MFG.
P.O. BOX 196
WAQUOIT MA 02356

TOWN OF BOURNE
BOURNE SHORE
24 FERRY AVENUE
BUZZARDS BAY MA 02532

RM.417
20 TURNPIKE ROAD
WESTBORO MA 01581

PARKER REALTY CORP
60 PRESCOTT STREEET
WORCESTER MA 01605

ROY I BOWLBY
5 NOTRE DAME ROAD
BEDFORD MA 01730

INDPNDNCE YACHT CL
28 VILLA DRIVE
FOXBORO MA 02035

MA.STATE COLL.SYST
53 STATE ROAD
BOSTON MA 02107

GREG FOSSELLA
479 COMM. AVENUE
BOSTON MA 02109

MASS. D.E.Q.E. DIV.WETLNDS.& WTR
LICENSE & PERMITS
1 WINTER STREET
BOSTON MA 02114

KARL E. WEISS
10 TODD ROAD
LEXINGTON MA 02173

WILLIAM I. KOCK
13 RIVERSIDE PARK
WESTON MA 02193

ALBERT PRATT
326 POWERPOINT DRIVE
DUXBURY MA 02332

BOURNE MARINA
1 ACADEMY DRIVE
BUZZARDS BAY MA 02532

SAIC

JOHN D. DONNELY
223 HOPFIN HILL RD.
N. ATTLEBORO MA 02760

SWANSEA MARINA
161 CALIFORNIA AVE.
SWANSEA MA 02777

ERNEST T. BESSE
435 DIVISION RD.
WESTPORT MA 02790

TOWN OF WESTPORT
TOWN HALL
WESTPORT MA 02790

MOBY DICK
RESTAURANT
1 BRIDGE STREET
WESTPORT MA 02791

F.L. TRIPP & SONS
P.O. BOX 023
WESTPORT POINT MA 02791

RONALD WAYNE
EILEEN M.WAYNE
31 COTTONTAIL LANE
NORWOLK CT 06854

PAUL MELLON
OAK SPRING
UPPERVILLE VA 22176

RICHARD W. LLOYD
411 PINE STREET
CAMDEN SC 29020

J.B. YOUNGBLOOD
649 AMALFI DRIVE
PACIFIC PALISADES CA 90272

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APPENDIX TABLE 3

RHODE ISLAND RAW DATA

OBS	ID1	V1A	V1B	V1C	V1D	V2	V3A	V3B	V3C	V4A	V4B	V4C	V4D	V4E	V5	V6A	V6B	V7	V8A	V8B	V9	CDL	ID2	V10A	V10B	V11	V12A	V12B	V13	V14	V15	EXPVOL	MAINTVOL	LC	LOCCLUS
1	1	1	2	.	.	.	2	.	100	14	.	.	.	.	1	14	.	1500	3	.	3	1	1	2	.	4	5	.	.	3	.	.	1500	1	1
2	2	1	1	3000	1	.	12	.	.	1	100	.	.	.	.	1	.	16500	12	.	1	1	2	1	1	4	2	.	12	3	.	.	.	1	1
3	3	1	1	500	1	.	12	.	.	1	100	.	.	.	1	1	.	500	2	.	2	1	3	2	.	34	2	400	12	3	.	.	.	1	1
4	4	1	1	1740	2	.	12	67	33	13	.	.	.	.	.	.	2	4500	5	.	4	1	4	2	.	2	2	3000	1	2	.	3015	1485	1	1
5	5	1	1	11000	2	.	2	.	100	14	.	.	.	.	3	1	.	10000	5	.	1	1	5	.	.	1	2	5000	1	3	.	.	10000	1	1
6	6	2	2	.	.	23	.	.	.	.	.	.	.	.	123	1	3	.	.	.	.	1	6	2	.	.	6	.	.	3	.	.	.	1	1
7	7	1	2	.	.	3	2	.	100	14	90	.	.	10	1	.	3	7400	2	.	4	1	7	2	.	34	2	.	1	3	5	.	7400	1	1
8	8	1	2	.	.	.	2	.	100	1	100	.	.	.	.	14	1	1500	2	.	4	1	8	2	.	12	4	.	1	3	10	.	1500	1	1
9	9	1	1	75	1	.	12	.	.	12	.	.	.	.	13	13	4	200	2	.	2	1	9	1	.	34	.	.	.	3	.	.	.	1	2
10	10	1	1	.	1	3	12	.	.	12	.	.	.	.	1	13	3	.	1	.	1	1	10	1	.	12	1	.	1	6	.	.	.	1	2
11	11	1	3	.	.	.	2	.	100	1	100	.	.	.	1	1	1	7500	1	.	1	1	11	2	.	13	1	7000	1	2	.	.	7500	1	2
12	12	2	2	.	.	12	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	12	2	.	2	4	.	1	3	.	.	.	1	1
13	13	2	2	.	.	2	2	.	100	.	.	.	.	.	5	3	.	1250	.	.	.	1	13	2	.	23	5	.	1	2	.	.	1250	1	3
14	14	1	1	350	1	.	2	.	400	14	99	.	.	1	13	134	.	350	2	.	2	1	14	1	1	3	1	.	1	3	.	.	350	1	3
15	15	1	2	.	.	.	2	.	100	1	.	.	.	.	3	3	1	10	2	.	2	1	15	2	.	4	2	25	1	3	.	.	10	1	4
16	16	2	2	.	.	1	.	.	.	.	.	.	.	.	13	13	.	850	2	.	2	1	16	1	1	13	3	850	1	7	.	.	.	2	3
17	17	1	2	.	.	.	2	.	100	1	100	.	.	.	0	1	.	20	3	.	3	1	17	2	.	5	1	.	1	7	.	.	20	2	4
18	18	1	1	.	.	4	2	.	100	2	.	100	.	.	13	3	14	20	2	.	2	1	18	2	.	15	1	.	1	3	.	.	20	2	4
19	19	2	2	.	.	4	.	.	.	.	.	.	.	.	3	3	3	.	.	.	.	1	19	2	.	23	5	.	1	3	.	.	.	2	4
20	20	1	2	.	.	.	2	.	100	2	.	100	.	.	3	3	4	15000	1	.	1	1	20	2	.	34	2	15000	124	5	.	.	15000	2	5
21	21	1	2	.	.	.	2	.	100	4	.	.	.	100	4	4	.	.	1	.	1	1	21	3	.	3	.	.	1	5	.	.	.	2	5
22	22	1	2	.	.	1	2	.	100	4	.	.	.	100	4	4	.	20	1	.	1	1	22	3	.	4	1	2	1	5	.	.	20	2	3
23	23	2	2	.	.	13	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	1	23	2	.	13	3	.	12	7	.	.	.	3	7
24	24	1	2	.	.	4	2	.	100	1	100	.	.	.	1	1	.	9700	2	.	2	1	24	2	.	23	2	.	1	3	.	.	9700	3	7
25	25	2	2	.	.	24	.	.	.	.	.	.	.	.	14	5	3	.	.	.	.	1	25	2	.	1	4	.	1	3	.	.	.	3	7
26	26	1	3	.	.	.	12	.	.	1	100	.	.	.	14	1	1	250	2	.	2	1	26	1	3	14	2	250	14	3	.	.	.	3	7
27	27	1	2	.	.	.	12	25	75	124	.	.	.	.	34	34	1	7800	5	.	4	1	27	3	.	13	2	1700	3	3	.	1950	5850	3	7
28	28	1	1	60000	1	.	2	.	100	124	83	17	.	.	4	14	.	8400	2	.	2	1	28	1	3	23	2	4700	1	3	.	.	8400	3	7
29	29	1	2	.	.	.	1	100	.	1	100	.	.	.	14	1	4	23000	2	.	24	1	29	1	.	15	2	15000	1	3	25	23000	.	3	7
30	30	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	30	.	.	.	.	.	.	.	.	.	.	3	6
31	31	1	2	.	.	.	2	.	100	12	.	.	.	.	134	12	14	2000	2	.	2	1	31	1	3	2	2	.	1	3	.	.	2000	3	6
32	32	1	1	100	1	.	12	50	50	1	100	.	.	.	1	1	1	3000	2	.	2	1	32	1	3	1	2	1000	4	3	.	1500	1500	3	6
33	33	2	2	.	.	18	.	.	.	.	.	.	.	.	3	0	.	.	.	.	.	1	33	2	.	34	5	.	12	6	.	.	.	3	7
34	34	3	2	.	.	4	2	.	100	4	.	.	.	100	4	4	1	800	5	.	2	1	34	3	.	13	4	.	1	6	.	.	800	3	6
35	35	2	2	.	.	8	.	.	.	.	.	.	.	.	4	4	.	.	.	.	.	1	35	2	.	13	4	.	1	6	.	.	.	3	6
36	36	1	2	.	.	.	1	100	.	4	.	.	.	100	.	.	.	.	.	.	4	1	36	3	.	3	.	.	.	5	.	.	.	4	8
37	37	2	2	.	.	25	2	.	100	.	.	.	.	.	13	13	.	100	.	.	.	1	37	2	.	23	2	100	1	2	.	.	100	3	6
38	38	1	1	4600	1	.	2	.	100	12	.	.	.	.	13	1	1	833	2	.	2	1	38	3	.	1	2	.	1	3	.	.	833	3	7
39	39	3	.	.	.	1	2	.	.	.	.	.	.	.	3	3	1	.	.	.	.	1	39	2	.	1	6	.	.	2	.	.	.	3	6
40	40	2	2	.	.	12	.	.	.	.	.	.	.	.	3	3	.	.	.	.	.	1	40	2	.	1	.	.	.	3	.	.	.	3	6
41	41	2	.	.	.	2	.	.	.	.	.	.	.	.	3	13	1	.	.	.	.	1	41	2	.	13	6	.	.	3	.	.	.	3	6
42	42	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	42	2	.	2	6	.	.	8	.	.	.	4	10
43	43	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	43	3	.	3	5	.	.	7	.	.	.	4	9
44	44	3	2	.	.	16	1	.	.	.	.	.	.	.	0	6	.	.	.	.	.	1	44	3	.	15	3	.	1	3	.	.	.	3	6
45	45	2	.	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	45	2	.	1	6	.	12	7	.	.	.	3	8
46	46	2	.	.	.	7	2	.	100	12	.	.	.	.	13	13	.	680	5	.	1	1	46	3	.	13	2	150	1	7	.	.	680	4	8
47	47	2	1	.	.	17	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	47	3	.	13	5	.	1	7	.	.	.	4	8
48	48	3	1	.	.	1	2	.	100	1	100	.	.	.	1	13	.	.	1	.	1	1	48	2	.	1	6	.	1	4	.	.	.	4	8
49	49	1	1	25000	3	.	12	22	78	124	.	.	.	.	13	13	14	.	1	.	1	1	49	1	1	23	2	10000	124	5	.	.	.	4	8

OBS	IDI	V1A	V1B	V1C	V1D	V2	V3A	V3B	V3C	V4A	V4B	V4C	V4D	V4E	V5	V6A	V6B	V7	V8A	V8B	V9	CDI	ID2	V10A	V10B	V11	V12A	V12B	V13	V14	V15	EXPVCL	HAZARVUL	LOC	LOCCLUS
50	50	1	1	100	1	.	2	.	100	1	100	.	.	.	1	1	1	450	1	.	1	1	50	3	.	36	1	100	1	5	.	.	450	4	7
51	51	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	51	2	.	5	5	.	1	5	.	.	.	4	7
52	52	1	2	.	.	.	2	.	100	4	.	.	.	100	4	6	.	45	1	.	1	1	52	3	.	3	1	5	1	5	.	.	45	4	8
53	53	2	2	.	.	1	.	.	.	.	.	.	.	.	0	3	.	.	.	.	.	1	53	2	.	4	5	.	1	5	.	.	.	3	9
54	54	1	2	.	.	3	2	.	100	14	.	.	.	.	14	1	3	6800	2	.	2	1	54	2	.	3	3	3500	4	3	.	.	6800	3	9
55	55	2	1	4150	.	12	.	.	.	.	.	.	.	.	1	13	.	.	.	.	.	1	55	1	1	2	3	.	14	3	.	.	.	3	7
56	56	1	1	350	2	.	2	.	100	1	100	.	.	.	13	13	1	25	2	.	4	1	56	2	.	13	2	25	1	7	.	.	25	4	7
57	57	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	57	2	.	3	5	.	1	3	.	.	.	5	11
58	58	1	2	.	.	.	1	100	.	1	100	.	.	.	0	0	4	15000	2	.	26	1	58	2	.	13	5	.	1	3	.	15000	.	5	11
59	59	2	.	.	.	3	12	50	50	1	100	.	.	.	0	13	.	.	2	.	2	1	59	2	.	13	2	.	.	3	.	.	.	5	11
60	60	2	.	.	.	11	2	.	100	.	.	.	.	.	3	13	.	.	5	.	5	1	60	.	.	3	5	.	1	1	.	.	.	5	13
61	61	2	2	.	.	1	.	.	.	2	.	100	.	.	3	36	.	.	.	.	.	1	61	3	.	3	6	.	.	3	.	.	.	5	11
62	62	1	1	.	1	.	12	25	75	1	100	.	.	.	0	3	.	2000	1	.	16	1	62	3	.	13	1	.	1	8	.	500	1500	5	11
63	63	2	2	.	.	16	.	.	.	.	.	.	.	.	13	0	.	.	.	.	.	1	63	2	.	13	5	.	1	7	.	.	.	5	13
64	64	1	2	.	.	.	12	50	50	12	85	15	.	.	13	13	4	.	5	.	5	1	64	3	.	3	1	.	1	6	.	.	.	5	12
65	65	1	2	.	.	.	2	.	100	2	.	100	.	.	3	123	.	.	1	.	1	1	65	1	1	3	1	.	1	6	.	.	.	5	11
66	66	3	1	700	1	1	.	.	.	.	.	.	.	.	3	6	.	.	5	.	1	1	66	1	1	3	6	.	.	3	.	.	.	5	13
67	67	3	1	3500	1	1	.	.	.	1	100	.	.	.	3	3	3	35000	5	.	14	1	67	2	.	3	1	3500	1	1	5	.	.	5	11
68	68	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	68	2	.	3	5	.	1	2	.	.	.	6	14
69	69	1	1	830	2	.	2	.	100	1	100	.	.	.	1	13	3	35000	5	.	2	1	69	1	1	.	3	35000	1	3	.	.	35000	6	15
70	70	2	2	.	.	5	2	.	100	1	100	.	.	.	1	1	1	2000	5	.	16	1	70	2	.	1	3	2000	1	3	.	.	2000	6	15
71	71	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	71	2	.	1	5	.	13	3	.	.	.	6	15
72	72	2	2	.	.	12	.	.	.	.	.	.	.	.	3	3	.	.	.	.	.	1	72	2	.	1	3	.	1	6	.	.	.	6	15
73	73	2	2	.	.	24	.	.	.	.	.	.	.	.	3	3	12	.	.	.	.	1	73	2	.	1	3	.	1	6	.	.	.	6	15
74	74	2	2	.	.	1	.	.	.	.	.	.	.	.	0	4	.	.	.	.	.	1	74	2	.	1	3	460	1	6	.	.	.	6	15
75	75	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	75	2	.	35	5	.	.	2	.	.	.	6	14
76	76	3	2	.	.	.	1	100	.	12	15	85	.	.	0	0	4	1250000	3	.	3	1	76	1	1	3	5	.	1	5	.	1250000	.	6	16
77	77	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	77	.	.	.	.	.	.	.	.	.	.	6	16
78	78	1	2	.	.	.	2	.	100	1	100	.	.	.	1	1	1	630	5	.	5	1	78	2	.	1	5	.	1	7	.	.	630	6	15
79	79	2	2	.	.	37	2	.	100	2	.	100	.	.	3	3	1	.	1	.	1	1	79	3	.	12	3	.	1	2	.	.	.	6	17
80	80	2	1	-150	1	.	2	.	100	4	.	.	.	100	4	14	.	135	2	.	26	1	80	2	.	13	1	25	12	3	.	.	135	6	15
81	81	1	2	.	.	25	2	.	100	124	50	50	.	.	134	134	12	10000	1	.	1	1	81	2	.	23	4	10000	1	3	.	.	10000	6	15
82	82	1	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	82	.	.	.	5	.	.	3	.	.	.	6	15
83	83	1	2	.	.	.	2	.	100	1	100	.	.	.	13	13	3	300	5	.	12	1	83	2	.	13	4	300	1	2	.	.	300	6	15
84	84	1	2	.	.	3	12	25	75	14	50	.	.	50	14	14	1	1100	5	.	2	1	84	3	.	3	2	100	1	3	.	275	825	7	20
85	85	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	85	2	.	3	5	.	1	3	.	.	.	7	20
86	86	1	2	.	.	.	2	.	100	12	75	25	.	.	134	134	12	4400	5	.	3	1	86	2	.	3	3	5000	1	3	.	.	4400	7	18
87	87	1	1	329	1	.	2	.	100	4	.	.	.	100	4	4	1	1900	5	.	3	1	87	2	.	3	2	600	12	6	.	.	1900	7	18
88	88	1	2	.	.	.	2	.	100	4	.	.	.	100	4	4	1	1900	5	.	3	1	88	2	.	3	2	600	12	6	.	.	1900	7	19
89	89	2	.	.	.	2	.	.	.	4	.	.	.	100	4	4	.	.	.	.	.	1	89	2	.	.	.	.	.	2	.	.	.	7	18
90	90	1	2	.	.	.	2	.	100	4	.	.	.	100	4	4	3	100	2	.	3	1	90	2	.	34	1	27	1	3	.	.	100	7	19
91	91	1	2	.	.	2	12	.	.	12	.	.	.	.	13	1	3	850	3	.	3	1	91	2	.	34	5	.	1	6	.	.	.	7	19
92	92	2	2	.	.	28	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	92	2	.	34	5	.	1	5	.	.	.	7	20
93	93	1	1	2000	2	.	2	.	100	14	50	.	.	50	0	1	1	1000	2	.	2	1	93	1	3	3	2	.	1	2	.	.	1000	8	21
94	94	2	2	.	.	16	2	.	100	.	.	.	.	.	0	0	.	.	.	.	.	1	94	1	.	1	5	.	4	6	.	.	.	8	21
95	95	1	2	.	.	1	2	.	100	2	.	100	.	.	3	3	1	870	5	.	5	1	95	3	.	1	6	.	.	3	.	.	870	8	21
96	96	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	96	2	.	1	5	.	1	3	.	.	.	8	21
97	97	1	1	600	1	.	2	.	100	12	.	.	.	.	3	3	.	540	1	.	1	1	97	2	.	3	2	.	1	7	.	.	540	8	21
98	98	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	98	2	.	1	6	.	.	7	.	.	.	8	21

OBS	ID1	V1A	V1B	V1C	V1D	V2	V3A	V3B	V3C	V4A	V4B	V4C	V4D	V4E	V5	V6A	V6B	V7	V8A	V8B	V9	CD1	ID2	V10A	V10B	V11	V12A	V12B	V13	V14	V15	EXPVOL	MAINTVOL	LOC	LOCCLUS
99	99	2	1	1170	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	99	3	.	2	6	.	.	3	.	.	.	8	21
100	100	1	2	.	.	5	2	.	100	1	100	.	.	.	1	14	1	675	5	.	2	1	100	2	.	2	2	500	1	3	.	.	675	8	21
101	101	1	2	.	.	4	2	.	100	14	.	.	.	.	134	134	1	2900	23	.	23	1	101	2	.	2	3	1000	1	3	.	.	2900	9	24
102	102	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	102	1	1	4	5	.	1	6	.	.	.	9	24
103	103	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	103	.	.	.	5	.	1	6	.	.	.	9	22
104	104	2	2	.	.	58	.	.	.	.	.	.	.	.	4	0	.	.	.	.	.	1	104	.	.	3	6	.	1	6	.	.	.	9	24
105	105	2	2	.	.	5	.	.	.	.	.	.	.	.	4	4	.	.	.	.	.	1	105	1	.	1	2	.	1	6	.	.	.	8	21
106	106	2	2	.	.	8	.	.	.	.	.	.	.	.	4	4	.	.	.	.	.	1	106	1	.	1	5	.	1	6	.	.	.	9	25
107	107	2	2	.	.	6	.	.	.	.	.	.	.	.	4	0	.	.	.	.	.	1	107	1	.	3	1	.	1	6	.	.	.	9	25
108	108	2	2	.	.	5	.	.	.	.	.	.	.	.	4	4	.	.	.	.	.	1	108	1	.	1	2	.	1	6	.	.	.	9	24
109	109	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	109	1	.	3	5	.	1	6	.	.	.	9	24
110	110	2	2	.	.	4	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	110	1	.	1	5	.	1	6	.	.	.	9	24
111	111	2	2	.	.	48	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	111	1	.	1	.	.	1	6	.	.	.	9	25
112	112	2	2	.	.	4	.	.	.	.	.	.	.	.	4	4	.	.	.	.	.	1	112	1	.	1	3	.	1	6	.	.	.	9	24
113	113	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	113	1	.	1	5	.	1	6	.	.	.	9	24
114	114	2	2	.	.	6	.	.	.	.	.	.	.	.	4	4	.	.	.	.	.	1	114	2	.	34	1	.	1	6	.	.	.	9	25
115	115	2	.	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	115	1	.	4	5	.	1	7	.	.	.	9	24
116	116	1	2	.	.	.	2	.	100	4	.	.	.	100	34	34	1	20	1	.	1	1	116	2	.	2	1	2	1	5	.	.	20	9	22
117	117	2	2	.	.	68	.	.	.	.	.	.	.	.	4	4	1	.	.	.	.	1	117	.	.	3	6	.	.	5	.	.	.	9	24
118	118	2	2	.	.	1	.	.	.	.	.	.	.	.	4	4	1	.	.	.	.	1	118	2	.	35	5	.	1	5	.	.	.	9	25
119	119	1	2	.	.	.	2	.	100	4	.	.	.	100	4	4	1	70	1	.	1	1	119	2	.	3	1	7	1	5	.	.	70	9	24
120	120	1	1	120	1	.	2	.	100	4	.	.	.	100	4	4	1	200	1	.	1	1	120	2	.	4	1	100	1	5	.	.	200	9	25
121	121	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	121	.	.	.	.	.	.	.	.	.	.	9	24
122	122	1	2	.	.	.	12	.	.	124	.	.	.	.	1	14	14	13000	2	.	6	1	122	1	1	.	2	6500	1	3	.	.	.	9	24
123	123	1	2	.	.	3	1	100	.	1	100	.	.	.	1	1	4	5000	2	.	5	1	123	1	3	3	6	.	.	7	.	5000	.	9	24
124	124	1	2	.	.	.	1	100	.	12	.	.	.	.	13	13	4	80000	23	.	5	1	124	1	1	2	2	12500	4	2	.	80000	.	9	22
125	125	3	2	.	.	3	2	.	100	14	50	.	.	50	1	1	12	10000	5	.	6	1	125	2	.	12	5	.	1	3	.	.	10000	9	22
126	126	1	2	.	.	.	2	.	100	14	97	.	.	3	14	14	12	450	2	.	2	1	126	1	1	3	4	.	1	3	.	.	450	9	22
127	127	1	2	.	.	23	2	.	100	124	.	.	.	.	13	13	3	10000	2	.	26	1	127	1	1	.	3	.	1	3	.	.	10000	9	23
128	128	1	2	.	.	.	2	.	100	1	100	.	.	.	1	1	2	3500	2	.	2	1	128	2	.	13	3	.	1	3	.	.	3500	9	23
129	129	2	.	.	.	24	.	.	.	.	.	.	.	.	3	3	.	.	.	.	.	1	129	2	.	1	.	.	.	2	.	.	.	9	24
130	130	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	130	2	.	1	6	.	.	7	.	.	.	9	24
131	131	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	131	.	.	.	.	.	.	.	.	.	.	9	24
132	132	1	2	.	.	2	12	90	10	14	.	.	.	.	1	1	1	2700	5	.	4	1	132	3	.	13	4	.	1	3	.	2430	270	9	24
133	133	1	2	.	.	.	2	.	100	12	75	25	.	.	1	1	3	1000	2	.	2	1	133	2	.	1	2	1000	1	3	.	.	1900	9	24
134	134	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	134	.	.	.	.	.	.	.	.	.	.	9	24
135	135	1	2	.	.	.	2	.	100	12	.	.	.	.	13	1	12	35000	1	.	5	1	135	2	.	1	2	.	.	3	.	.	35000	9	25
136	136	1	2	.	.	.	12	40	60	1	100	.	.	.	1	1	1	5000	2	.	4	1	136	1	3	.	4	2000	12	3	.	2000	3000	9	24
137	137	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	137	.	.	.	.	.	.	.	.	.	.	9	24
138	138	1	2	.	.	.	1	100	.	1	100	.	.	.	.	13	1	12000	1	.	4	1	138	1	1	13	2	5500	14	3	8	12000	.	9	24
139	139	1	2	.	.	.	12	88	12	14	.	.	.	.	14	1	1	10000	2	.	2	1	139	1	3	1	2	11000	1	3	.	8800	1200	9	24
140	140	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	140	.	.	.	.	.	.	.	.	.	.	9	25
141	141	1	2	.	.	.	12	.	.	12	.	.	.	.	13	1	.	.	5	.	2	1	141	2	.	2	2	.	4	3	.	.	.	10	26
142	142	1	2	.	.	.	2	.	100	12	60	40	.	.	1	13	.	15000	35	.	3	1	142	1	1	.	4	15000	1	2	.	.	15000	10	27
143	143	1	2	.	.	.	2	.	100	12	95	5	.	.	1	1	3	10000	2	.	5	1	143	1	1	.	2	.	1	2	.	.	10000	10	27
144	144	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	144	2	.	3	4	.	.	4	.	.	.	10	27
145	145	1	.	.	.	3	2	.	100	1	100	.	.	.	13	1	3	1100	5	.	4	1	145	1	.	.	2	.	1	2	.	.	1100	10	27
146	146	2	1	36000	1	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	146	1	1	2	4	15000	14	1	.	.	.	11	31
147	147	1	2	.	.	.	1	100	.	1	100	.	.	.	1	1	4	500000	3	.	4	1	147	1	1	12	6	.	124	1	.	500000	.	11	31

OBS	IDI	V1A	V1B	V1C	V1D	V2	V3A	V3B	V3C	V4A	V4B	V4C	V4D	V4E	V5	V6A	V6B	V7	V8A	V8B	V9	CDI	ID2	V10A	V10B	V11	V12A	V12B	V13	V14	V15	EXPVUL	MAINTVUL	LOC	LOCCLUS
148	148	1	1	7000	1	.	2	.	100	1	100	.	.	.	1	1	3	6000	2	.	4	1	148	1	1	2	2	5500	4	1	35	.	6000	12	26
149	149	1	1	3000	2	.	2	.	100	1	100	.	.	.	1	13	3	9000	5	.	3	1	149	1	1	2	2	3500	1	1	.	.	9000	12	26
150	150	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	150	2	.	.	.	.	.	1	.	.	.	12	29
151	151	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	151	2	.	1	.	.	.	1	.	.	.	11	31
152	152	2	3	.	.	1	.	.	.	.	.	.	.	.	0	6	.	.	.	.	.	1	152	3	.	.	6	.	.	1	.	.	.	11	31
153	153	2	2	.	.	7	.	.	.	.	.	.	.	.	0	1	3	.	.	.	.	1	153	2	.	.	6	.	.	1	.	.	.	12	20
154	154	2	.	.	.	7	2	.	100	1	100	.	.	.	1	1	.	.	.	.	.	1	154	3	.	12	6	.	.	1	.	.	.	12	20
155	155	3	2	.	.	.	2	.	100	1	100	.	.	.	0	1	4	10000	5	.	4	1	155	2	.	1	2	10000	2	1	45	.	10000	12	28
156	156	2	2	.	.	17	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	156	.	.	.	.	.	.	1	.	.	.	12	28
157	157	1	2	.	.	7	2	.	100	1	100	.	.	.	1	1	3	.	.	.	.	1	157	3	.	.	2	.	1	1	.	.	.	12	28
158	158	3	2	.	.	1	.	.	.	.	.	.	.	.	0	6	.	.	.	.	.	1	158	2	.	12	6	.	.	1	.	.	.	12	28
159	159	3	2	.	.	45	.	.	.	.	.	.	.	.	0	1	4	5200	5	.	5	1	159	3	.	1	4	.	1	1	70	.	.	12	29
160	160	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	160	2	.	1	5	.	.	1	.	.	.	12	28
161	161	2	2	.	.	17	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	161	3	.	1	6	.	2	1	.	.	.	12	28
162	162	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	162	2	.	1	5	.	.	7	.	.	.	12	29
163	163	1	2	.	.	.	2	.	100	1	100	.	.	.	1	1	4	65000	5	.	3	1	163	.	.	1	1	.	.	6	.	.	65000	12	28
164	164	2	2	.	.	3	.	.	.	.	.	.	.	.	1	1	4	.	.	.	.	1	164	1	3	.	5	.	1	1	.	.	.	12	28
165	165	1	2	.	.	35	2	.	100	1	100	.	.	.	1	1	1	175000	5	.	4	1	165	2	.	2	6	.	2	1	.	.	175000	12	28
166	166	2	2	.	.	17	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	166	.	.	.	5	.	.	1	.	.	.	12	29
167	167	2	2	.	.	17	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	167	.	.	12	5	.	.	1	.	.	.	12	28
168	168	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	168	3	.	.	5	.	1	3	.	.	.	12	29
169	169	1	2	.	.	.	2	.	100	12	.	.	.	.	13	3	1	.	5	.	5	1	169	3	.	2	2	.	12	6	.	.	.	13	30
170	170	1	2	.	.	3	12	60	40	1	100	.	.	.	13	13	14	133	3	.	3	1	170	1	3	1	5	.	1	3	.	79.0	53	13	30
171	171	2	1	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	171	1	3	.	5	.	.	1	.	.	.	11	31
172	172	1	1	.	1	.	2	.	100	1	100	.	.	.	1	1	1	.	24	.	24	1	172	1	3	.	6	.	.	1	.	.	.	11	31
173	173	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	173	2	.	36	6	.	.	6	.	.	.	11	32
174	174	2	2	.	.	7	.	.	.	.	.	.	.	.	0	C	.	.	.	.	.	1	174	2	.	3	2	.	1	1	.	.	.	12	31
175	175	1	1	5600	.	.	2	.	100	1	100	.	.	.	1	134	.	2500	2	.	1	1	175	1	1	14	2	.	1	3	.	.	2500	11	33
176	176	1	2	.	.	.	2	.	100	1	100	.	.	.	0	1	1	12500	3	.	3	1	176	2	.	.	3	.	4	1	.	.	12500	12	31
177	177	1	2	.	.	.	1	100	.	1	100	.	.	.	1	0	4	2500	2	.	2	1	177	2	.	4	4	.	1	2	.	2500.0	.	11	33
178	178	1	2	.	.	.	2	.	100	124	50	40	.	10	13	13	12	800	2	.	5	1	178	2	.	1	2	15	1	3	.	.	800	11	32
179	179	1	1	60	.	25	2	.	100	1	100	.	.	.	13	13	3	100	5	.	6	1	179	2	.	.	1	20	1	3	.	.	100	11	32
180	180	2	2	.	.	1	.	.	.	.	.	.	.	.	0	C	.	.	.	.	.	1	180	2	.	1	5	.	1	6	.	.	.	14	35
181	181	2	2	.	.	8	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	181	2	.	1	5	.	1	9	.	.	.	14	32
182	182	1	2	.	.	.	12	.	.	1	100	.	.	.	1	0	4	.	5	.	2	1	182	2	.	.	2	.	1	3	.	.	.	14	35
183	183	2	2	.	.	2	.	.	.	.	.	.	.	.	1	1	.	.	5	.	.	1	183	.	.	5	5	.	1	2	.	.	.	14	35
184	184	2	1	3000	2	7	.	.	.	.	.	.	.	.	134	14	1	575	.	.	.	1	184	2	.	13	4	.	1	3	.	.	.	14	35
185	185	1	2	.	.	.	12	20	80	124	60	40	.	.	34	134	14	50000	2	.	14	1	185	1	1	12	4	10000	4	3	.	10000.0	40000	14	34
186	186	1	.	.	.	3	2	.	100	1	100	.	.	.	13	13	3	270	2	.	1	1	186	1	3	3	1	.	1	3	.	.	270	14	34
187	187	2	2	.	.	2	.	.	.	.	.	.	.	.	134	134	.	1100	5	.	5	1	187	3	.	14	3	.	.	6	.	.	.	15	36
188	188	1	2	.	.	3	1	100	.	1	100	.	.	.	0	1	4	4500	2	.	2	1	188	1	1	13	2	200	4	7	.	4500.0	.	15	37
189	189	1	3	.	.	.	2	.	100	1	100	.	.	.	1	1	1	.	5	.	5	1	189	2	.	1	2	.	1	7	.	.	.	15	36
190	190	1	2	.	.	.	2	.	100	1	100	.	.	.	0	1	.	4000	5	.	5	1	190	2	.	16	2	2000	1	4	.	.	4000	15	36
191	191	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	191	2	.	3	5	.	1	3	.	.	.	15	37
192	192	1	1	200	3	.	1	100	.	4	.	.	.	100	4	4	4	4900	2	.	2	1	192	1	.	1	5	.	.	7	.	4900.0	.	15	36
193	193	1	1	.	1	.	2	.	100	1	100	.	.	.	1	1	4	.	2	.	2	1	193	.	.	1	.	.	1	7	.	.	.	15	36
194	194	1	1	775	1	.	2	.	100	12	50	50	.	.	13	13	4	175	2	.	2	1	194	1	1	45	5	.	1	3	.	.	175	15	36
195	195	1	2	.	.	.	2	.	100	1	100	.	.	.	1	1	1	170	5	.	3	1	195	2	.	1	5	.	1	7	.	.	170	15	36
196	196	1	2	.	.	.	2	.	100	1	100	.	.	.	0	1	.	220	5	.	5	1	196	2	.	1	4	220	1	7	.	.	220	15	36

OBS	ID1	V1A	V1B	V1C	V1D	V2	V3A	V3B	V3C	V4A	V4B	V4C	V4D	V4E	V5	V6A	V6B
197	197	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.
198	198	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.
199	199	1	2	.	.	.	2	.	100	1	100	.	.	.	1	1	1
200	200	2	2	.	.	12	.	.	.	.	.	.	.	.	0	0	.
201	201	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.
202	202	2	3	.	.	12	.	.	.	.	.	.	.	.	0	0	.
203	203	2	2	.	.	12	.	.	.	.	.	.	.	.	0	0	.
204	204	2	2	.	.	16	.	.	.	.	.	.	.	.	0	0	.
205	205	2	2	.	.	2	.	.	.	.	.	.	.	.	13	13	1
206	206	1	2	.	.	.	2	.	100	12	.	.	.	.	0	3	.
207	207	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
208	208	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.
209	209	1	2	.	.	.	12	50	50	13	75	.	25	.	123	123	1
210	210	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.
211	211	2	2	.	.	8	.	.	.	.	.	.	.	.	34	34	.
212	212	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
213	213	3	2	.	.	.	12	.	.	12	65	35	.	.	13	13	1
214	214	2	2	.	.	3	12	.	.	.	.	.	.	.	4	4	.
215	215	1	1	4000	1	.	1	100	.	4	.	.	.	100	0	14	4
216	216	2	2	.	.	1	.	.	.	.	.	.	.	.	1	0	.
217	217	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.
218	218	1	1	7	3	.	2	.	100	4	.	.	.	100	4	4	1
219	219	3	2	.	.	1	2	.	100	2	.	100	.	.	0	3	.
220	220	2	2	.	.	1	.	.	.	.	.	.	.	.	0	6	.
221	221	1	1	2100	2	.	12	70	30	124	33	33	.	33	1	1	4
222	222	1	2	.	.	.	12	80	20	14	98	.	.	2	4	4	1
223	223	1	2	.	.	.	12	20	80	12	50	50	.	.	13	13	2
224	224	1	2	.	.	.	1	100	.	14	.	.	.	.	0	0	4
225	225	1	2	.	.	.	12	90	10	5	25	75	.	.	1	14	14
226	226	1	2	.	.	.	1	100	.	1	100	.	.	.	0	0	4
227	227	1	2	.	.	.	2	.	100	14	75	.	.	25	1	1	1
228	228	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.
229	229	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.
230	230	2	2	.	.	18	.	.	.	.	.	.	.	.	0	3	.
231	231	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.
232	232	2	2	.	.	8	.	.	.	.	.	.	.	.	0	0	.
233	233	2	2	.	.	18	.	.	.	.	.	.	.	.	0	0	.
234	234	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.
235	235	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.
236	236	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.
237	237	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.
238	238	2	1	.	.	17	.	.	.	.	.	.	.	.	0	0	.
239	239	1	1	3000	3	.	2	.	100	12	20	80	.	.	3	3	.
240	240	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.
241	241	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.
242	242	1	2	.	.	.	2	.	100	12	.	.	.	.	13	13	1
243	243	1	2	.	.	.	2	.	100	12	90	10	.	.	1	1	1
244	244	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
245	245	1	2	.	.	.	2	.	100	124	45	45	.	10	13	1	12

OBS	V7	V8A	V8B	V9	CD1	ID2	V10A	V10B	V11	V12A	V12B	V13	V14	V15	EXPVOL	MAINTVOL	LUC	LOCCLUS
197	.	.	.	.	1	197	2	.	14	6	.	.	3	.	.	.	15	36
198	.	.	.	.	1	198	2	.	23	.	.	2	7	.	.	.	15	36
199	600	2	.	2	1	199	2	.	2	2	.	1	3	.	.	600	15	36
200	.	.	.	.	1	200	2	.	.	6	.	1	5	.	.	.	16	40
201	.	.	.	.	1	201	.	.	.	5	.	.	5	.	.	.	16	40
202	.	.	.	.	1	202	3	.	.	6	.	.	5	.	.	.	16	40
203	.	.	.	.	1	203	3	.	3	6	.	.	5	.	.	.	16	40
204	.	.	.	.	1	204	2	.	.	.	.	.	5	.	.	.	16	40
205	.	.	.	.	1	205	2	.	4	6	.	1	5	.	.	.	16	19
206	4500	5	.	5	1	206	2	.	.	4	4500	14	8	.	.	4500	16	38
207	.	.	.	.	1	207	.	.	.	.	.	.	.	.	.	.	16	38
208	.	.	.	.	1	208	2	.	1	5	.	1	6	.	.	.	16	38
209	.	1	.	1	1	209	2	.	1	5	.	1	6	.	.	.	16	38
210	.	.	.	.	1	210	2	.	1	5	.	1	6	.	.	.	16	38
211	.	.	.	.	1	211	2	.	23	5	.	1	5	.	.	.	16	39
212	.	.	.	.	1	212	.	.	.	.	.	.	.	.	.	.	16	38
213	.	5	.	5	1	213	2	.	1	6	.	.	2	.	.	.	16	37
214	.	5	.	5	1	214	2	.	1	6	.	.	3	.	.	.	16	39
215	20000	2	.	2	1	215	1	1	34	5	.	4	3	.	20000	.	17	41
216	.	.	.	.	1	216	2	.	3	5	.	1	3	.	.	.	17	41
217	.	.	.	.	1	217	2	.	3	5	.	1	5	.	.	.	17	41
218	.	.	.	26	1	218	2	.	2	1	100	1	5	.	.	.	17	42
219	.	5	.	2	1	219	2	.	13	5	.	1	3	.	.	.	17	41
220	.	.	.	.	1	220	2	.	15	3	3100	1	7	.	.	.	17	41
221	15000	2	.	2	1	221	2	.	4	3	2000	1	3	50	10500	4500	17	41
222	10000	12	.	2	1	222	2	.	34	6	.	.	3	.	8000	2000	17	41
223	15000	35	.	3	1	223	2	.	34	2	.	1	3	.	3000	12000	17	41
224	6500	3	.	3	1	224	3	.	45	4	.	1	3	.	6500	.	17	42
225	53400	3	.	3	1	225	2	.	12	2	5840	12	7	.	52560	5840	18	45
226	368000	23	.	4	1	226	1	1	45	5	.	4	2	.	368000	.	19	45
227	1000	5	.	5	1	227	2	.	3	5	.	1	7	.	.	1000	19	44
228	.	.	.	.	1	228	2	.	1	5	.	2	6	.	.	.	19	44
229	.	.	.	.	1	229	2	.	1	5	.	2	6	.	.	.	19	44
230	.	.	.	.	1	230	2	.	5	5	.	2	6	.	.	.	19	44
231	.	.	.	.	1	231	2	.	1	5	.	12	6	.	.	.	19	44
232	.	.	.	.	1	232	2	.	1	5	.	1	6	.	.	.	19	44
233	.	.	.	.	1	233	2	.	1	5	.	1	6	.	.	.	19	44
234	.	.	.	.	1	234	2	.	15	5	.	1	7	.	.	.	19	44
235	.	.	.	.	1	235	2	.	15	5	.	1	7	.	.	.	19	44
236	.	.	.	.	1	236	2	.	1	3	1100	1	3	.	.	.	19	44
237	.	.	.	.	1	237	2	.	1	5	.	1	6	.	.	.	19	44
238	.	.	.	.	1	238	3	.	.	6	.	.	7	.	.	.	19	46
239	4000	5	.	5	1	239	3	.	34	3	4000	14	8	.	.	4000	19	46
240	.	.	.	.	1	240	1	1	13	3	.	2	3	.	.	.	19	44
241	.	.	.	.	1	241	2	.	2	5	.	13	2	.	.	.	19	44
242	110	5	.	4	1	242	3	.	1	5	.	.	3	.	.	110	19	44
243	77	5	.	5	1	243	2	.	2	2	.	1	3	.	.	77	19	44
244	.	.	.	.	1	244	.	.	.	.	.	.	.	.	.	.	19	44
245	1000	5	.	46	1	245	1	1	1	2	.	13	3	.	.	1000	19	44

OBS	IDI	V1A	V1B	V1C	V1D	V2	V3A	V3B	V3C	V4A	V4B	V4C	V4D	V4E	V5	V6A	V6B	V7	V8A	V8B	V9	CDI	ID2	V10A	V10B	V11	V12A	V12B	V13	V14	V15	EXPVOL	MAINTVOL	LOC	LOCCLUS
246	246	1	2	.	.	5	2	.	100	1	100	.	.	.	0	1	1	.	5	.	5	1	246	2	.	1	4	.	4	3	.	.	.	19	44
247	247	1	2	.	.	23	2	.	100	14	50	.	.	50	14	14	1	3000	5	.	3	1	247	1	1	15	7	750	13	3	.	.	3000	19	44
248	248	1	2	.	.	.	2	.	100	1	100	.	.	.	1	1	.	1000	3	.	3	1	248	1	1	1	1	150	2	3	.	.	1000	19	44
249	249	1	1	15000	1	.	2	.	100	12	50	50	.	.	13	13	.	250	2	.	2	1	249	1	1	1	1	200	12	3	.	.	250	19	45
250	250	1	1	.	.	.	2	.	100	12	30	70	.	.	1	1	.	100	2	.	2	1	250	1	1	1	1	700	12	3	.	.	100	19	44
251	251	1	3	.	.	35	2	.	100	14	.	.	.	.	14	14	3	.	5	.	6	1	251	1	1	1	1	1500	1	3	.	.	.	19	44
252	252	2	2	.	.	2	.	.	.	.	.	.	.	.	1	1	14	.	.	.	.	1	252	2	.	1	2	.	1	2	.	.	.	19	44
253	253	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	253	2	.	1	5	.	1	3	.	.	.	19	44
254	254	2	2	.	.	7	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	254	2	.	5	.	.	.	7	.	.	.	19	44
255	255	1	2	.	.	.	1	100	.	1	100	.	.	.	0	0	4	.	5	.	5	1	255	2	.	2	5	.	1	2	.	.	.	19	.
256	256	1	2	.	.	.	2	.	100	1	100	.	.	.	1	1	.	.	5	.	5	1	256	2	.	1	2	.	1	3	.	.	.	19	44
257	257	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	257	2	.	1	5	.	1	7	.	.	.	19	44
258	258	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	258	3	.	1	6	.	2	7	.	.	.	19	44
259	259	2	2	.	.	1	.	.	.	.	.	.	.	.	3	3	3	.	.	.	.	1	259	2	.	3	.	.	.	4	.	.	.	19	44
260	260	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	260	2	.	1	5	.	1	4	.	.	.	19	44
261	261	2	1	.	.	17	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	261	2	.	5	5	.	1	7	.	.	.	19	46
262	262	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	262	2	.	3	5	.	1	6	.	.	.	19	43
263	263	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	263	2	.	45	5	.	1	5	.	.	.	19	44
264	264	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	264	2	.	5	5	.	1	5	.	.	.	19	44
265	265	2	.	.	.	8	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	1	265	1	1	2	2	.	1	1	10	.	.	20	48
266	266	3	1	10000	1	4	2	.	100	1	100	.	.	.	1	1	1	10000	2	.	2	1	266	2	.	7	2	10000	1	1	45	.	10000	70	48
267	267	2	2	.	.	18	.	.	.	.	.	.	.	.	1	0	.	.	.	.	.	1	267	2	.	1	4	.	.	6	.	.	.	20	47
268	268	2	3	.	.	18	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	268	3	.	35	5	.	1	6	.	.	.	20	47
269	269	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	269	3	.	3	5	.	1	6	.	.	.	20	47
270	270	2	2	.	.	16	.	.	.	.	.	.	.	.	0	0	1	.	.	.	.	1	270	2	.	.	5	.	1	6	.	.	.	20	47
271	271	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	271	2	.	1	5	.	1	3	.	.	.	20	47
272	272	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	272	.	.	.	.	.	.	.	.	.	.	20	47
273	273	1	2	.	.	.	12	75	25	1	100	.	.	.	0	1	1	.	5	.	4	1	273	2	.	1	2	.	34	2	.	.	.	20	47
274	274	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	274	2	.	1	5	.	.	3	.	.	.	20	47
275	275	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	275	2	.	13	5	.	1	7	.	.	.	20	47
276	276	2	2	.	.	1	.	.	.	.	.	.	.	.	4	4	1	.	.	.	.	1	276	2	.	34	4	.	1	5	.	.	.	21	45
277	277	2	2	.	.	14	.	.	.	.	.	.	.	.	3	13	.	.	.	.	.	1	277	2	.	3	.	.	.	7	.	.	.	21	49
278	278	1	2	.	.	3	12	80	20	14	85	.	.	15	14	1	.	5000	2	.	3	1	278	1	1	34	5	750	1	3	.	4000	1000	21	49
279	279	1	2	.	.	.	2	.	100	1	100	.	.	.	1	1	.	2200	2	.	6	1	279	1	1	46	3	.	1	3	.	.	2200	21	49
280	280	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	280	2	.	3	5	.	1	2	.	.	.	21	6
281	281	1	2	.	.	.	1	100	.	2	.	100	.	.	3	3	4	.	1	.	1	1	281	2	.	3	4	.	14	8	.	.	.	4	7
282	282	1	2	.	.	.	1	100	.	2	.	100	.	.	3	3	4	.	1	.	1	1	282	2	.	3	4	.	14	8	.	.	.	4	8
283	283	2	2	.	.	1	.	.	.	.	.	.	.	.	0	6	.	.	.	.	.	1	283	2	.	13	5	.	4	6	.	.	.	9	23
284	284	1	1	45000	1	.	2	.	100	2	.	100	.	.	3	23	.	25000	1	.	5	1	284	.	.	23	7	25000	4	8	.	.	25000	5	11
285	285	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	285	.	.	.	5	.	14	8	.	.	.	.	45
286	286	1	1	40000	1	.	2	.	100	2	.	100	.	.	3	3	.	40000	1	.	1	1	286	.	.	3	2	40000	14	8	.	.	40000	3	6
287	287	1	2	.	.	.	2	.	100	2	.	100	.	.	3	3	.	30000	5	.	5	1	287	1	.	23	5	30000	1	8	.	.	30000	1	2
288	288	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	288	.	.	12	5	.	14	8	.	.	.	19	44
289	289	1	2	.	.	.	2	.	100	2	.	100	.	.	3	23	.	35000	3	.	56	1	289	1	.	2	2	32500	14	8	.	.	35000	13	26
290	290	1	2	.	.	.	2	.	100	23	.	80	20	.	23	23	.	20000	1	.	5	1	290	1	3	3	2	50000	.	8	.	.	20000	4	10
291	291	3	2	.	.	.	2	.	100	2	.	100	.	.	3	6	.	250000	5	.	4	1	291	1	.	23	2	250000	14	8	.	.	250000	12	28
292	292	1	2	.	.	.	2	.	100	3	.	.	100	.	2	2	.	25000	5	.	1	1	292	2	.	3	5	25000	14	8	.	.	25000	20	49
293	293	2	2	.	.	8	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	293	2	.	1	5	.	14	8	.	.	.	20	33
294	294	1	2	.	.	.	2	.	100	23	.	75	25	.	23	23	.	30000	5	.	34	1	294	1	.	23	5	27500	14	8	.	.	30000	9	24

SAIC

APPENDIX TABLE 4

MASSACHUSETTS RAW DATA

OBS	ID1	V1A	V1B	V1C	V1D	V2	V3A	V3B	V3C	V4A	V4B	V4C	V4D	V4E	V5	V6A	V6B	V7	V8A	V8B	V9	CO1	ID2	V10A	V10B	V11	V12A	V12B	V13	V14	V15	EXPVOL	MAINTVOL	LOC
1	1	1	2	.	.	.	2	.	.	124	.	.	.	.	134	124	.	.	.	.	1	1	1	3	3	.	.	.	.	3	.	.	.	1
2	2	1	3	.	.	.	2	.	.	234	.	.	.	.	234	234	.	5000	3	.	1	1	2	1	1	3	1	.	2	6	.	.	.	.
3	3	1	3	.	.	.	12	.	.	134	.	.	.	.	134	124	.	10000	2	.	4	1	3	2	2	.	1	.	2	3	3	.	.	30
4	4	1	3	.	.	.	2	.	.	1	.	.	.	.	1	1	.	2000	4	.	3	1	4	1	3	.	1	.	2	3	10	.	.	32
5	5	2	2	.	.	2	.	.	.	.	.	.	.	.	1	1	.	.	.	.	.	1	5	2	.	.	.	.	.	3	.	.	.	17
6	6	1	2	.	.	.	1	.	.	12	.	.	.	.	12	12	.	200	1	.	1	1	6	2	.	.	3	.	.	3	.	.	.	31
7	7	1	1	.	1	.	2	.	.	5	.	.	.	.	5	5	.	.	3	.	1	1	7	1	1	1	2	.	1	3	.	.	.	32
8	8	1	3	.	1	.	2	.	.	3	.	.	.	.	2	2	.	200	2	.	5	1	8	2	.	.	1	.	1	3	.	.	.	39
9	9	2	2	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	9	.	.	.	.	.	.	3	.	.	.	43
10	10	2	2	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	10	.	.	.	.	.	.	2	.	.	.	30
11	11	1	3	.	.	.	12	.	.	2	.	.	.	.	3	3	.	.	1	.	4	1	11	1	1	3	1	.	2	6	.	.	.	18
12	12	1	3	.	.	.	2	.	.	1	.	.	.	.	1	1	.	.	1	.	2	1	12	1	1	3	3	.	2	7	.	.	.	18
13	13	1	3	.	.	.	2	.	.	5	.	.	.	.	5	5	.	15000	1	.	4	1	13	1	1	13	1	.	2	6	.	.	.	11
14	14	2	.	.	.	23	.	.	.	.	.	.	.	.	.	3	.	.	.	.	.	1	14	.	.	.	.	.	.	7	.	.	.	6
15	15	2	.	.	.	1	.	.	.	.	.	.	.	.	.	0	.	.	.	.	.	1	15	.	.	.	.	.	.	3	.	.	.	36
16	16	1	.	.	2	.	2	.	.	4	.	.	.	.	4	4	.	.	1	.	.	1	16	1	3	.	1	.	2	3	20	.	.	6
17	17	1	1	.	1	.	2	.	.	12	.	.	.	.	13	13	.	.	5	.	.	1	17	1	.	5	1	.	.	7	.	.	.	30
18	18	1	2	.	1	.	12	.	.	12	.	.	.	.	12	12	.	6000	3	.	5	1	18	1	1	3	3	.	3	3	20	.	.	16
19	19	1	1	.	2	4	2	.	.	3	.	.	.	.	3	2	.	1200	4	.	.	1	19	1	1	3	1	.	1	7	.	.	.	19
20	20	1	1	.	1	.	2	.	.	12	.	.	.	.	12	13	.	.	1	.	1	1	20	3	3	1	3	.	1	7	.	.	.	30
21	21	1	1	.	.	.	2	.	.	1	.	.	.	.	1	1	.	400	2	.	5	1	21	3	3	3	.	.	.	7	.	.	.	27
22	22	1	.	.	.	.	2	.	.	1	.	.	.	.	1	1	.	110	5	.	1	1	22	1	1	3	2	.	1	7	.	.	.	19
23	23	1	.	.	.	.	2	.	.	2	.	.	.	.	3	3	.	30000	1	.	5	1	23	1	1	3	2	.	.	6	.	.	.	22
24	24	1	.	.	.	.	12	.	.	1	.	.	.	.	1	1	.	.	4	.	3	1	24	1	3	3	2	.	1	5	.	.	.	3
25	25	1	1	.	1	.	2	.	.	4	.	.	.	.	4	4	.	3000	2	.	5	1	25	1	1	23	1	.	2	3	30	.	.	16
26	26	1	.	.	.	.	2	.	.	12	.	.	.	.	13	13	.	.	2	.	3	1	26	1	1	.	1	.	2	1	.	.	.	31
27	27	1	1	.	2	.	2	.	.	2	.	.	.	.	3	3	.	.	3	.	.	1	27	2	.	.	.	.	.	1	.	.	.	31
28	28	2	.	.	.	1	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	1	28	.	.	.	.	.	.	7	.	.	.	41
29	29	2	.	.	.	2	.	.	.	.	.	.	.	.	.	4	.	.	.	.	.	1	29	.	.	.	.	.	.	3	.	.	.	18
30	30	1	.	.	.	.	2	.	.	1	.	.	.	.	1	1	.	5000	5	.	3	1	30	2	.	.	2	.	1	3	.	.	.	37
31	31	1	.	.	.	.	2	.	.	4	.	.	.	.	4	4	.	100	1	.	1	1	31	2	.	.	2	.	1	7	.	.	.	32
32	32	1	.	.	.	.	2	.	.	2	.	.	.	.	3	3	.	.	3	.	.	1	32	3	3	.	.	.	.	3	.	.	.	3
33	33	2	2	.	.	1	.	.	.	.	.	.	.	.	.	0	.	.	.	.	.	1	33	.	.	.	.	.	.	2	.	.	.	.
34	34	2	.	.	.	24	.	.	.	.	.	.	.	.	.	0	.	.	.	.	.	1	34	2	.	.	.	.	.	3	.	.	.	12
35	35	1	1	.	1	.	2	.	.	1	.	.	.	.	1	1	.	.	2	.	1	1	35	1	1	3	1	.	1	2	.	.	.	29
36	36	2	.	.	.	1	.	.	.	.	.	.	.	.	.	0	.	.	.	.	.	1	36	2	.	.	.	.	.	2	.	.	.	42
37	37	1	.	.	.	.	.	2	.	123	.	.	.	.	123	123	.	.	2	.	2	1	37	3	3	.	2	.	.	3	.	.	.	43
38	38	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	38	.	.	.	.	.	.	7	.	.	.	42
39	39	2	1	.	1	4	2	.	.	13	.	.	.	.	12	12	.	.	5	.	5	1	39	2	.	3	1	.	.	7	.	.	.	14
40	40	2	2	.	1	1	.	.	.	.	.	.	.	.	.	14	.	.	.	.	.	1	40	.	.	.	.	.	.	3	.	.	.	15
41	41	2	1	.	1	2	.	.	.	13	.	.	.	.	12	13	.	.	3	.	1	1	41	3	.	3	.	.	.	3	.	.	.	7
42	42	1	1	.	1	.	2	.	.	12	.	.	.	.	13	13	.	.	5	.	1	1	42	3	.	3	.	.	.	6	.	.	.	24
43	43	3	2	.	.	1	12	.	.	3	.	.	.	.	2	2	.	.	5	.	1	1	43	2	.	.	4	.	1	3	.	.	.	5
44	44	1	1	.	1	.	2	.	.	2	.	.	.	.	3	3	.	.	5	.	5	1	44	1	1	3	.	.	.	7	.	.	.	43
45	45	1	1	.	1	.	2	.	.	1	.	.	.	.	1	.	.	500	3	.	3	1	45	1	1	3	2	.	1	3	.	.	.	19
46	46	2	2	.	.	23	.	.	.	.	.	.	.	.	.	134	.	.	.	.	.	1	46	.	.	.	.	.	.	3	.	.	.	39
47	47	1	1	.	1	.	2	.	.	1	.	.	.	.	1	1	.	960	1	.	2	1	47	2	.	.	1	.	1	3	5	.	.	19
48	48	1	2	.	.	.	2	.	.	5	.	.	.	.	5	5	.	.	5	.	3	1	48	2	.	.	2	.	1	3	.	.	.	22
49	49	1	1	.	1	.	2	.	.	1	.	.	.	.	1	1	.	200	5	.	.	1	49	1	1	3	2	.	1	3	.	.	.	22

OBS	IDI	V1A	V1B	V1C	V1D	V2	V3A	V3B	V3C	V4A	V4B	V4C	V4D	V4E	V5	V6A	V6B	V7	V8A	V8B	V9	CDL	ID2	V10A	V10B	V11	V12A	V12B	V13	V14	V15	EXPVOL	MAINTVOL	LOC
50	50	2	.	.	.	1	.	.	.	.	.	.	.	.	.	0	.	.	.	.	.	1	50	.	.	.	.	.	.	3	.	.	.	13
51	51	1	.	.	.	.	2	.	.	1	.	.	.	.	1	1	.	.	5	.	5	1	51	1	3	.	2	.	1	3	.	.	.	43
52	52	2	.	.	.	3	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	1	52	.	.	.	.	.	.	7	.	.	.	43
53	53	1	2	.	.	.	12	.	.	1	.	.	.	.	1	1	.	2000	2	.	5	1	53	2	.	2	5	.	1	3	.	.	.	25
54	54	2	.	.	.	4	.	.	.	.	.	.	.	.	.	0	.	1000	.	.	.	1	54	.	.	.	.	.	1	3	.	.	.	25
55	55	1	1	.	1	.	2	.	.	4	.	.	.	.	4	4	.	.	5	.	.	1	55	2	3	.	1	.	1	3	.	.	.	36
56	56	1	2	.	.	.	2	.	.	1	.	.	.	.	1	1	.	.	1	.	4	1	56	1	3	.	2	.	1	6	.	.	.	41
57	57	1	.	.	.	.	2	.	.	5	.	.	.	.	5	5	.	600	1	.	2	1	57	3	3	.	1	.	1	3	.	.	.	36
58	58	1	1	.	3	.	2	.	.	1	.	.	.	.	1	1	.	200	5	.	2	1	58	1	1	2	.	.	2	3	20	.	.	15
59	59	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	59	.	.	.	.	.	.	.	.	.	.	28
60	60	2	.	.	.	1	.	.	.	.	.	.	.	.	0	.	.	.	.	.	.	1	60	.	.	.	.	.	.	3	.	.	.	15
61	61	1	2	.	.	.	2	.	.	2	.	.	.	.	3	3	.	.	5	.	.	1	61	.	.	.	.	.	.	.	.	.	.	26
62	62	2	2	.	.	1	.	.	.	.	.	.	.	.	.	4	.	.	.	.	.	1	62	.	.	.	.	.	.	7	.	.	.	26
63	63	2	2	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	5	.	.	1	63	.	.	.	.	.	.	7	.	.	.	26
64	64	1	1	.	1	.	2	.	.	12	.	.	.	.	5	.	.	2000	1	.	1	1	64	1	1	13	3	.	1	3	.	.	.	43
65	65	1	.	.	.	.	1	.	.	24	.	.	.	.	34	34	.	10000	1	.	.	1	65	1	3	.	.	.	1	3	20	.	.	20
66	66	1	1	.	1	.	2	.	.	1	.	.	.	.	1	1	.	.	1	.	4	1	66	3	3	.	3	.	1	7	.	.	.	20
67	67	1	2	.	.	.	2	.	.	4	.	.	.	.	4	4	.	.	5	.	.	1	67	2	.	.	.	.	.	3	.	.	.	36
68	68	1	1	.	3	.	2	.	.	1	.	.	.	.	1	1	.	.	5	.	.	1	68	1	3	.	1	.	1	7	.	.	.	8
69	69	1	1	.	1	.	2	.	.	23	.	.	.	.	23	23	.	.	1	.	5	1	69	1	1	23	2	.	2	7	.	.	.	30
70	70	3	3	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	70	.	.	.	.	.	.	.	.	.	.	13
71	71	1	1	.	3	.	2	.	.	2	.	.	.	.	3	.	.	75000	1	.	3	1	71	1	1	23	1	.	1	6	20	.	.	6
72	72	1	2	.	.	.	2	.	.	4	.	.	.	.	4	4	.	1000	5	.	5	1	72	1	1	.	2	.	1	6	15	.	.	37
73	73	2	2	.	.	3	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	1	73	.	.	.	.	.	.	3	.	.	.	3
74	74	2	2	.	.	3	.	.	.	.	.	.	.	.	.	14	.	.	.	.	.	1	74	.	.	.	.	.	.	3	.	.	.	3
75	75	2	2	.	.	1	.	.	.	.	.	.	.	.	.	0	.	.	.	.	.	1	75	.	.	.	.	.	.	3	.	.	.	3
76	76	1	.	.	.	.	1	.	.	2	.	.	.	.	3	3	.	.	5	.	4	1	76	1	1	3	.	.	14	6	.	.	.	22
77	77	2	2	.	.	3	.	.	.	.	.	.	.	.	.	0	.	.	.	.	.	1	77	.	.	.	.	.	.	3	.	.	.	32
78	78	2	.	.	.	1	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	1	78	.	.	.	.	.	.	3	.	.	.	29
79	79	2	2	.	.	23	.	.	.	.	.	.	.	.	.	5	.	.	.	.	.	1	79	.	.	.	.	.	.	3	.	.	.	37
80	80	2	2	.	.	1	.	.	.	.	.	.	.	.	.	0	.	.	.	.	.	1	80	.	.	.	.	.	.	6	.	.	.	16
81	81	2	.	.	.	1	.	.	.	.	.	.	.	.	.	0	.	.	.	.	.	1	81	.	.	.	.	.	.	7	.	.	.	17
82	82	1	1	.	1	.	2	.	.	1	.	.	.	.	1	1	.	200	1	.	5	1	82	1	1	.	2	.	2	7	10	.	.	23
83	83	1	1	.	1	.	2	.	.	24	.	.	.	.	34	34	.	100	2	.	5	1	83	1	1	2	1	.	2	2	0	.	.	32
84	84	2	1	.	3	1	.	.	.	.	.	.	.	.	.	0	.	.	.	.	.	1	84	.	.	.	.	.	.	7	.	.	.	30
85	85	1	2	.	.	.	.	.	.	.	.	.	.	.	.	0	.	.	.	.	.	1	85	.	.	.	.	.	.	3	.	.	.	42
86	86	1	1	.	3	.	2	.	.	3	.	.	.	.	2	2	.	.	5	.	5	1	86	2	.	.	1	.	12	7	.	.	.	11
87	87	1	.	.	.	.	2	.	.	13	.	.	.	.	3	.	.	10000	4	.	3	1	87	1	1	2	3	.	1	3	.	.	.	.
88	88	1	.	.	.	.	12	.	.	123	.	.	.	.	1	.	.	3500	2	.	5	1	88	1	1	23	1	.	12	3	.	.	.	19
89	89	2	2	.	.	2	.	.	.	.	.	.	.	.	3	.	.	.	.	.	.	1	89	.	.	.	.	.	.	3	.	.	.	25
90	90	1	.	.	.	.	12	.	.	12	.	.	.	.	1	1	.	250	5	.	1	1	90	1	2	.	2	.	1	3	.	.	.	6
91	91	2	2	.	.	1	.	.	.	.	.	.	.	.	.	0	.	.	.	.	.	1	91	2	.	.	.	.	.	2	.	.	.	43
92	92	1	1	.	3	.	2	.	.	41	.	.	.	.	14	.	.	10000	1	.	5	1	92	2	.	.	2	.	1	7	10	.	.	34
93	93	2	2	.	.	1	.	.	.	.	.	.	.	.	.	0	.	.	.	.	.	1	93	.	.	.	.	.	.	3	.	.	.	34
94	94	1	.	.	.	.	2	.	.	1	.	.	.	.	1	1	.	25	2	.	5	1	94	1	1	4	.	.	1	3	.	.	.	31
95	95	1	3	.	.	.	2	.	.	1	.	.	.	.	1	.	.	.	3	.	2	1	95	1	1	3	1	.	1	6	.	.	.	24
96	96	1	.	.	.	.	2	.	.	2	.	.	.	.	23	.	.	40000	4	.	1	1	96	1	1	3	1	.	1	2	7	.	.	2
97	97	2	.	.	.	1	.	.	.	.	.	.	.	.	.	0	.	.	.	.	.	1	97	2	.	.	.	.	.	7	.	.	.	8
98	98	1	.	.	.	.	2	.	.	4	.	.	.	.	3	.	.	.	4	.	3	1	98	2	.	.	1	.	1	3	5	.	.	23

OBS	ID1	V1A	V1B	V1C	V1D	V2	V3A	V3B	V3C	V4A	V4B	V4C	V4D	V4E	V5	V6A	V6B	V7	V8A	V8B	V9	CO1	ID2	V10A	V10B	V11	V12A	V12B	V13	V14	V15	EXPVOL	MAINTVOL	LOC
99	99	1	.	.	.	.	2	.	.	2	.	.	.	.	0	3	.	.	5	.	4	1	99	3	3	.	2	.	1	6	.	.	.	28
100	100	2	2	.	.	1	.	.	.	.	.	.	.	.	0	.	.	.	.	.	.	1	100	.	.	.	.	.	.	2	.	.	.	15
101	101	1	.	.	.	.	12	.	.	1	.	.	.	.	1	.	.	100	1	.	2	1	101	1	1	3	2	.	1	3	0	.	.	6
102	102	1	.	.	.	.	1	.	.	123	.	.	.	.	123	.	.	35000	3	.	3	1	102	1	1	32	1	.	1	6	.	.	.	1
103	103	1	.	.	.	.	2	.	.	1	.	.	.	.	1	.	.	2500	2	.	5	1	103	1	3	.	1	.	1	3	0	.	.	19
104	104	2	.	.	.	1	.	.	.	.	.	.	.	.	.	0	.	.	.	.	.	1	104	.	.	.	.	.	.	3	15	.	.	36
105	105	1	.	.	.	.	2	.	.	234	.	.	.	.	3	.	.	100000	41	.	3	1	105	1	.	3	1	.	2	6	25	.	.	43
106	106	1	.	.	.	.	2	.	.	4	.	.	.	.	4	.	.	.	2	.	5	1	106	1	3	.	2	.	1	3	0	.	.	43
107	107	1	.	.	.	.	2	.	.	1	.	.	.	.	1	12	.	150	5	.	.	1	107	2	.	.	4	.	1	7	.	.	.	43
108	108	2	.	.	.	1	.	.	.	.	.	.	.	.	.	0	.	.	.	.	.	1	108	.	.	.	.	.	.	3	.	.	.	33
109	109	1	.	.	.	.	2	.	.	14	.	.	.	.	1	.	.	.	13	.	5	1	109	2	.	.	2	.	1	3	.	.	.	30
110	110	2	.	.	.	3	.	.	.	.	.	.	.	.	.	0	.	.	.	.	.	1	110	.	.	.	.	.	.	3	.	.	.	41
111	111	2	2	.	.	23	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	1	111	.	.	.	.	.	.	3	.	.	.	35
112	112	1	.	.	.	.	1	.	.	124	.	.	.	.	134	134	.	534470	5	.	5	1	112	1	1	3	4	.	2	8	50	.	.	2
113	113	2	.	.	.	1	.	.	.	.	.	.	.	.	.	0	.	.	.	.	.	1	113	.	.	.	.	.	.	3	.	.	.	15
114	114	2	.	.	.	13	.	.	.	.	.	.	.	.	.	0	.	.	.	.	.	1	114	.	.	.	.	.	.	3	.	.	.	43
115	115	1	2	.	.	.	2	.	.	12	.	.	.	.	13	13	.	.	5	.	.	1	115	3	3	.	.	.	.	3	.	.	.	3
116	116	1	.	.	.	.	2	.	.	1	.	.	.	.	1	1	.	80	12	.	3	1	116	2	.	.	2	.	2	3	5	.	.	20
117	117	2	.	.	.	23	.	.	.	.	.	.	.	.	.	0	.	.	.	.	.	1	117	.	.	.	.	.	.	6	.	.	.	40
118	118	1	.	.	.	.	2	.	.	23	.	.	.	.	23	23	.	5000	1	.	1	1	118	1	1	13	1	.	1	2	.	.	.	13
119	119	1	.	.	.	.	1	.	.	1	.	.	.	.	1	1	.	.	5	.	.	1	119	2	.	.	2	.	.	7	.	.	.	10
120	120	1	.	.	.	.	2	.	.	12	.	.	.	.	13	.	.	500	1	.	1	1	120	1	1	3	1	.	1	6	2	.	.	18
121	121	2	.	.	.	1	.	.	.	.	.	.	.	.	.	124	.	.	.	.	.	1	121	.	.	.	.	.	.	2	.	.	.	19
122	122	1	.	.	.	.	12	.	.	14	.	.	.	.	14	14	.	1000	12	.	2	1	122	1	1	.	2	.	1	3	0	.	.	29
123	123	2	.	.	.	1	.	.	.	.	.	.	.	.	.	4	.	.	.	.	.	1	123	.	.	.	.	.	.	3	.	.	.	43
124	124	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	124	.	.	.	.	.	.	.	.	.	.	43
125	125	2	.	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	125	.	.	.	.	.	.	7	.	.	.	43
126	126	1	.	.	.	.	2	.	.	1	.	.	.	.	3	3	.	200	12	.	.	1	126	3	3	.	1	.	1	3	.	.	.	5
127	127	1	.	.	.	.	2	.	.	2	.	.	.	.	3	3	.	.	34	.	.	1	127	1	3	.	.	.	1	7	.	.	.	.
128	128	1	.	.	.	.	2	.	.	5	.	.	.	.	5	.	.	.	2	.	5	1	128	3	3	.	1	.	12	7	.	.	.	38
129	129	3	1	.	.	.	2	.	.	4	.	.	.	.	0	0	.	190	5	.	.	1	129	2	3	.	1	.	12	7	.	.	.	19
130	130	1	.	.	.	.	12	.	.	234	.	.	.	.	234	234	.	50000	1	.	5	1	130	1	3	.	2	.	1	6	.	.	.	10
131	131	2	2	.	.	3	.	.	.	.	.	.	.	.	.	4	.	.	.	.	.	1	131	.	.	.	.	.	.	3	.	.	.	11
132	132	2	.	.	.	2	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	1	132	.	.	.	.	.	.	3	.	.	.	19
133	133	2	.	.	.	12	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	1	133	.	.	.	.	.	.	3	.	.	.	21
134	134	1	2	.	.	.	.	.	.	2	.	.	.	.	3	3	.	.	5	.	.	1	134	3	3	.	.	.	.	3	.	.	.	25
135	135	2	.	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	135	.	.	.	.	.	.	3	.	.	.	43
136	136	1	3	.	.	.	2	.	.	24	.	.	.	.	34	34	.	.	2	.	.	1	136	3	3	.	1	.	1	3	.	.	.	23
137	137	1	.	.	.	.	12	.	.	14	.	.	.	.	14	14	.	5000	2	.	5	1	137	1	1	21	1	.	1	3	.	.	.	12
138	138	2	2	.	.	1	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	138	.	.	.	.	.	.	6	.	.	.	12
139	139	1	1	.	3	.	2	.	.	234	.	.	.	.	234	234	.	.	5	.	3	1	139	3	3	.	1	.	1	7	.	.	.	30
140	140	1	.	.	.	.	2	.	.	.	.	.	.	.	0	0	.	1000	2	.	5	1	140	2	.	.	2	.	1	7	0	.	.	30
141	141	1	2	.	.	.	2	.	.	1	.	.	.	.	1	1	.	13000	1	.	24	1	141	2	.	.	1	.	2	3	5	.	.	25
142	142	1	2	.	.	.	12	.	.	14	.	.	.	.	1	14	.	.	12	.	5	1	142	2	.	.	2	.	1	3	.	.	.	16
143	143	2	2	.	.	1	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	1	143	2	.	.	5	.	.	9	.	.	.	16
144	144	2	2	.	.	4	.	.	.	.	.	.	.	.	0	0	.	.	.	.	.	1	144	.	.	.	.	.	.	9	.	.	.	26
145	145	2	2	.	.	23	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	1	145	2	.	.	.	.	.	3	.	.	.	16
146	146	1	2	.	.	.	2	.	.	13	.	.	.	.	12	12	.	.	5	.	.	1	146	2	.	3	2	.	2	3	.	.	.	41
147	147	1	2	.	.	.	2	.	.	1	.	.	.	.	1	1	.	.	5	.	.	1	147	2	.	.	.	.	.	9	.	.	.	26

SAIC

OBS	ID1	V1A	V1B	V1C	V1D	V2	V3A	V3B	V3C	V4A	V4B	V4C	V4D	V4E	V5	V6A	V6B	V7	V8A	V8B	V9	CD1	ID2	V10A	V10B	V11	V12A	V12B	V13	V14	V15	EXPVOL	MAINTVOL	LOC
148	148	1	2	.	.	.	2	.	.	1	.	.	.	.	1	1	.	.	5	.	1	1	148	2	.	.	.	.	.	9	.	.	.	26
149	149	1	1	.	1	.	2	.	.	2	.	.	.	.	3	.	.	.	1	.	3	1	149	1	3	13	1	.	1	1	.	.	.	36
150	150	1	2	.	.	.	2	.	.	123	.	.	.	.	123	123	.	.	5	.	1	1	150	3	3	.	.	.	.	3	.	.	.	26
151	151	2	.	.	.	1	.	.	.	.	.	.	.	.	.	0	.	.	.	.	.	1	151	.	.	.	.	.	.	6	.	.	.	31
152	152	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	100000	4	.	.	1	152	.	.	.	.	.	.	8	.	.	.	4
153	153	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	25000	1	.	.	1	153	.	.	.	.	.	.	8	.	.	.	.
154	154	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	25000	1	.	.	1	154	.	.	.	2	.	.	8	.	.	.	24
155	155	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	155	.	.	.	.	.	.	8	.	.	.	42
156	156	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	50000	4	.	.	1	156	.	.	.	1	.	.	8	.	.	.	.
157	157	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	30000	14	.	.	1	157	1	1	23	2	.	.	8	.	.	.	19
158	158	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	25000	.	.	.	1	158	1	1	3	.	.	.	8	.	.	.	18
159	159	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	1	159	.	.	.	2	.	.	8	.	.	.	25
160	160	1	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	250000	1	.	.	1	160	1	1	3	1	.	.	8	.	.	.	6
161	161	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	36000	.	.	.	1	161	.	.	.	.	.	.	8	.	.	.	2
162	162	1	.	.	.	.	1	.	.	2	.	.	.	.	3	3	.	4000000	4	.	3	1	162	1	1	2	.	.	.	8	.	.	.	17
163	163	1	.	.	.	.	2	.	.	2	.	.	.	.	3	3	.	200000	5	.	.	1	163	1	2	.	3	.	.	6	.	.	.	9